Revalco®

Made in Italy

network analysers
multifunction meters

NETWORK ANALYSER

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PARAMETERS TABLE

	NETWORK ANALYSER THREE PHASE	SINGLE PHASE										
			ENER-GO									
	1RANM8N 2RAN968N	1RANM2	1RANM2CT	1RANM23	2RAN72C 2RAN96C 2RAN...C-C100	2RAN72C485 2RAN96C485 2RAN...C485-C100	1RANM6 2RAN96	1RANM6R 2RAN96R	1RANM6C 2RAN96C	1RANM6CS 2RAN96CS	1RANM6C485 2RAN96C485
DC Voltage 800 V max											
DC Voltage ..../100V by divider											
DC Current .../60mV											
Bidirectional power (kW)											
Bidirectional Total Energy (import/export)											
Bidirectional Ampere-hour Ah (import/export)											
Harmonic distorsion	●										
Total Harmonic distorsion	●										
Voltage / Current crest factor	●										
Active Energy 4 tarifs (+/-)	●										
Reactive Energy 4 tarifs (+/-)	●										
Total integration time (15min)	10,15,20,30,60min selectable										
Voltage phase-neutral	●	●	●	●	●	●	●	●	●	●	●
Voltage phase-phase	●			●	●	●	●	●	●	●	●
Medium phase voltage	●			●	●	●					
Current (direct insertion)		●									
Current (insertion by CT)	●		●	●	●	●	●	●	●	●	●
Current on neutral	●			●	●	●					
Medium Current	●										
Power Factor	●	●	●	●	●	●					
Total Power Factor	●			●	●	●			●	●	●
Apparent Power	●			●	●	●					
Total Apparent Power	●		●	●	●	●			●	●	●
Active Power (+/-)	●	●	●	●	●	●					
Total Active Power (+/-)	●			●	●	●			●	●	●
Reactive Power	●			●	●	●					
Total Reactive Power	●			●	●	●			●	●	●
Frequency	●		●	●	●	●			●	●	●
Total Active Energy (import) resettable	●	●	●	●	●	●			●	●	●
Relative Active Energy	●								●	●	●
Total Active Energy (export) resettable	●			●	●	●					
Total Reactive Energy resettable	●		●	●	●	●			●	●	●
Total working hours	●			●	●	●			●	●	●
Partial working hours resettable	●	●	●	●	●	●			●	●	●
Acoustic pre-alarm		●									
Phase sequence	●			●	●	●			●	●	●
Voltage asimmetry				●	●	●					
OUTPUT RELAY (alarm threshold)	●	1	1					2		2	
MODBUS SLAVE RTU RS232											
MODBUS SLAVE RTU RS485	●					●					●
BLUETOOTH ACCESS (max 10 meters - Class 2) Baude rate 115200											
PERMANENT MEMORY (EEPROM)	●										
400V insertion, 3 or 4 wires, 2 or 3 systems **(H1)**	selectable										
VT..../100V, 3 or 4 wires, 2 or 3 systems (0...9,9kV) **(H2)**	selectable										
VT..../100V, 3 or 4 wires, 2 or 3 systems (10...100kV) **(H3)**	selectable										
Software on www.revalco.it	●					●					●
Option Split Core CT (up to 100A)					●	●					
Option ETHERNET or PROFIBUS											
Dimensions in mm	8 DIN / 96x96	2 DIN		2 DIN	72x72 / 96x96		6 DIN / 96x96				

THREE PHASE A.C. AND SINGLE PHASE D.C. VERSIONS

1RANM6CS485 2RAN96CS485	1RANM6C232	1RAEM	1RAEMC	1RAEMCS	1RAEMC485	1RAEMCS485	1RAEMBL485	1RAEM4C 1RAEM4C-C100	1RAEM4CS 1RAEM4CS-C100	1RAEM4C485 1RAEM4C485-C100	1RAEM4CS485 1RAEM4CS485-C100	1RAEM4CDC 1RAEM4CSDC	1RAEM4C485DC 1RAEM4CS485DC	1RAEM4CHDC 1RAEM4CSHDC	1RAEM4C485HDC 1RAEM4CS485HDC	1RAEM410C - 1RAEM416C 1RAEM432C - 1RAEM463C	1RAEM410CS - 1RAEM416CS 1RAEM432CS - 1RAEM463CS	1RAEM410C485 - 1RAEM416C485 1RAEM432C485 - 1RAEM463C485	2RAE96L4C 2RAE72L4C	2RAE96L4CS	2RAE96L4C485 2RAE72L4C485	2RAE96L4CS485
												•										
														•								
												•		•								
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2	2			2		2	2		1		1	1	1	1	1		1	1		2		2
	•																					
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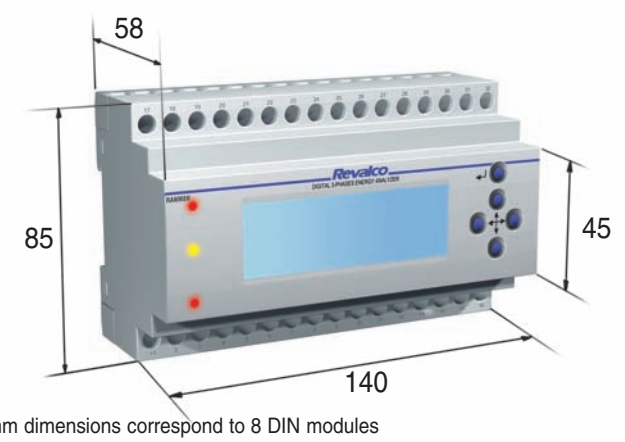
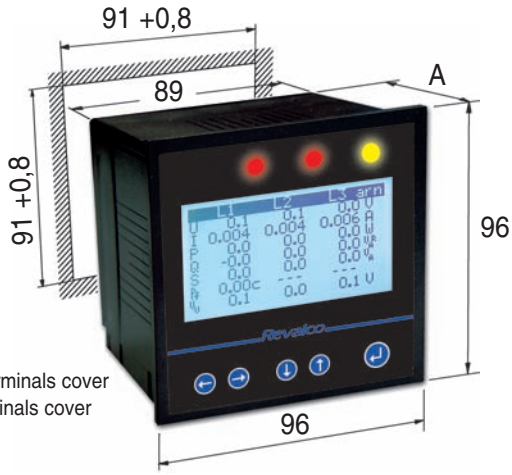
•	•				•	•	•			•	•	•		•							•	•
								•	•	•	•						•					
																					• 96x96	•
6 DIN		6 DIN / 96x96						4 DIN											72x72 / 96x96			96x96

NETWORK ANALYSERS 1RANM8N / 2RAN968N

DIMENSIONS in mm



The 140 mm dimensions correspond to 8 DIN modules
Weight: 0,61 Kg



A = 97,3 without terminals cover
A = 116,5 with terminals cover
Weight: 0,55 kg

INSTALLING AND CONNECTING

INSTALLATION PROCEDURE

1. Mount the instrument on DIN rail
2. ⚠ Turn power off before connecting the instrument to current transformers and/or voltage connections.
3. ⚠ Connect current lines to built-in current transformers (CTs). (OPTIONALY). Take care to orient the CTs correctly. Connect the voltage wires to the voltage measurement inputs. Start with the N wire.
4. Connect digital outputs (relay output terminals) to the quipment (if applicable).
5. Connect digital input port to the equipment (if applicable).
6. Connect RS 485 port to the communication network. Verify connect polarization.
7. Power on the instrument

CONNECTION - MEASUREMENT

The instrument incorporates internal current transformer (5 A input current), together with accompanying burden resistor. Pay attention to the polarity of current phases – they need to match the polarity of voltage phases. Instrument monitor will report incorrect power polarity otherwise. For extending voltage and current measuring range, use appropriate voltage and current transformers and set correct voltage and current transformation factors. Primary of voltage transformers have to be rated to handle line voltages and secondary have to match selected instrument voltage range. It is necessary to protect instruments voltage inputs with external fuses or circuit breakers. (not show in connection diagrams), 1 A or smaller fuses with 10 kA interr. current rating. Output of external current transformer will produce dangerous voltages if left open while current is flowing through primary winding. Do not disconnect CT output while it's connected to the live circuit to prevent damage to the CT or the operator.

TROUBLESHOOTING INSTALLATION PROBLEMS

In the case of incorrect power please check:
- verify that the instrument is showing the same current as measured in the 5 A CT loop. If this is not the case, verify current transformation factor set on instrument If this factor is set correctly, check the current harmonics.
- verify that the CTs are wired to the correct phases and oriented to match voltage phase orientations.
- verify the setting on the instrument (3-wire, 4 wire or Aaron) match instruments connection scheme.

In the case of inverse polarity of power (on all phase), use option Invert. Pwr. Sign in System setting configuration menu.

LEDS: YELLOW = comunication activity; RED = digital output status or energy pulse output indicators

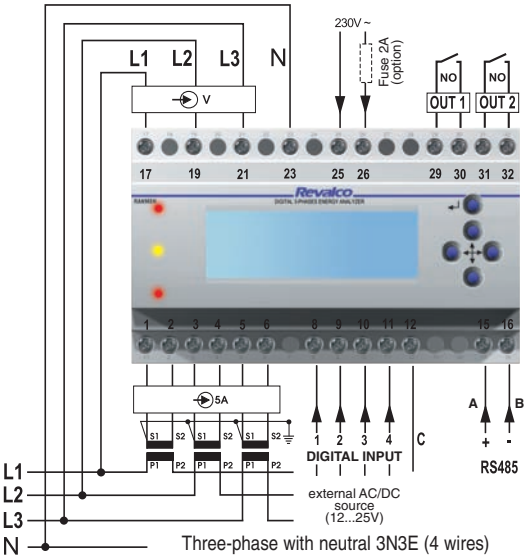
NETWORK COMMUNICATION

MODBUS PROTOCOL: RAN provides serial communication interface to other systems connected on MODBUS network. MODBUS is standard communications protocol in industry, allowing connecting industrial electronic devices across the network. RAN implements RTU serial transmission mode with CRC (cyclic redundancy check) error correction. ASCII mode is not supported. This allows remote reading and configuring of the meter by a MODBUS controller or PC with special control program. The communication protocol is a subset of Modicon MODBUS, OSI model level 7, providing client/server communication. Client role is provided by the master of network and the slave nodes as servers. The protocol is a master/slave protocol. Only one master and up to 247 slaves can be connected to the RS485 network at a time.
MODBUS communication is always initiated by a master (controller). Slaves never transmit data without a request, and never communicate between each other. Only one transaction is active at a time. The master always addresses one or all slaves (the master doesn't have an address). The master can address each slave individually (unicast mode). Conversation consists of request from the master and reply from the slave. Address of '0' is used for addresing all slaves at the same time (broadcast mode). Each device on MODBUS network must be assigned a unique address between 1 and 247. More than two devices on the same network with the same addresses, the communication will fail. RAN sends and receives data in fixed format. Data byte is binary coded and transmitted with least-significant bit first.
The baud rate is programmable as 4800 bps or 9600 with 8 bit data and 1 stop bit.
Available baud rates: 2400, 4800, 9600, 19200, 38400, 57600
Available formats: none parity / 1 stop bit, none parity / 2 stop bits, even parity / 1 stop bit

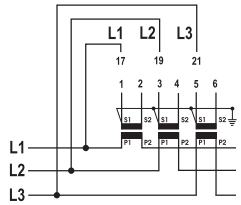
RS-485 CONNECTION: RS485 output drivers on RAMN8 supports up to 32 devices at a time, often it is necessary to install repeaters in MODBUS network where more than 32 devices are installed. Single pair of wires is used for connection (2-wire connection system). It is recommended to use screened twisted-pair cable to minimize noise-related signal errors. The cable screen must be connected to the connector housing (e.g. ground) at one side only (preferably at the controller/master). Maximum distance for reliable communication is 1000 m (baud rate 9600 ,2x1.5mm2 gauge). RS-485 requires line termination with two 100..150 Ω/0.5 W resistors. Install one resistor at the controller/master input/output and the other at the most remote device (at each extremity of the cable).
Visit web page http://www.modbus.org for more information about MODBUS network, hardware and software specifications.
It is possible to use standard PC, equipped with suitable program, as a MODBUS controller/master with an RS-485 driver/converter (two-wire, half duplex mode).
Available RS-232 to RS-485 converters handle data direction control automatically.

TROUBLESHOOTING COMMUNICATION PROBLEMS: If Power monitor doesn't communicate with the controller, please check:
- Verify the instrument
- Examine the interconnection cable
- Check that termination resistors (if installed and correct values)
- Verify that communication hardware is properly installed and working (PC or MODBUS controller
- Verify entered registers addresses
- Measure polarisation (d.c.) voltages present on a MODBUS network between D0(+) and D1(-), they should be lower than 7 V d.c.(toward COM/GND)
- If communication fails from time to time, the probable cause is noise on the network. Locate the noise source and remove the cabling from it, lower communication speed, use lower termination resistance.
- Make sure that the number of devices on a MODBUS network doesn't exceed maximum allowed (32 for the standard version of instrument, without repeater).
- Verify that a MODBUS network length doesn't exceed maximum allowed.
- If other devices installed in the network, verify that they conform to MODBUS.

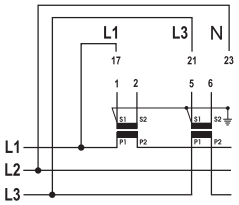
CONNECTION DIAGRAMS



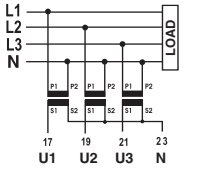
Three-phase with neutral 3N3E (4 wires)



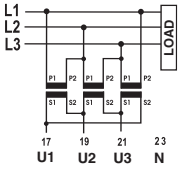
Three-phase without neutral 3-3E
(3 wires, balanced load)



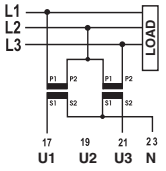
Three-phase without neutral 3-2E
(Aaron, balanced load)



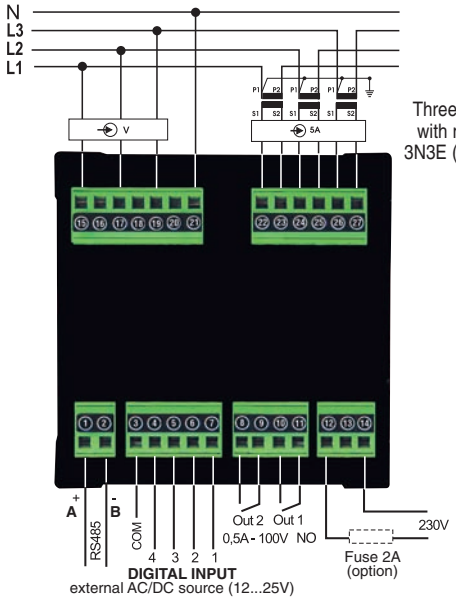
Three-phase with neutral
3N3E (4 wires)
voltage transformers connection



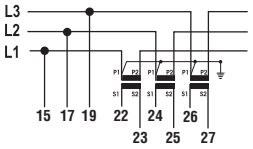
Three-phase without neutral
3-3E (3 wires, balanced load)
voltage transformers connection



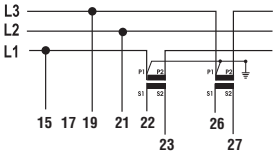
Three-phase without neutral
3-2E (Aaron, balanced load)
voltage transformers connection



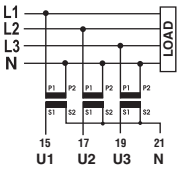
Three-phase
with neutral
3N3E (4 wires)



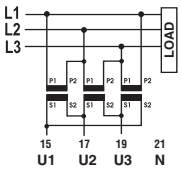
Three-phase without neutral 3-3E
(3 wires, balanced load)



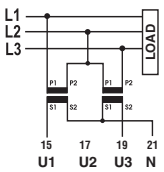
Three-phase without neutral 3-2E
(Aaron, balanced load)



Three-phase with neutral
3N3E (4 wires)
voltage transformers connection



Three-phase without neutral 3-3E
(3 wires, balanced load)
voltage transformers connection

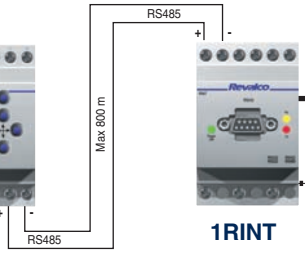


Three-phase without neutral 3-2E
(Aaron, balanced load)
voltage transformers connection

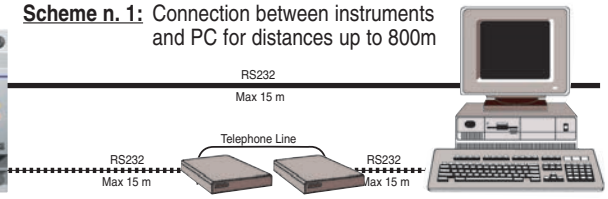
SERIAL COMMUNICATION

2RAN968N

1RANM8N



Scheme n. 1: Connection between instruments and PC for distances up to 800m



Scheme n. 2: Connection via Modem

INTRODUCTION

RAN is a quadrant power and energy meter for replacing many separate measuring instruments, like ammeters, voltmeters, power factor and power meters, energy counters, etc. The instrument can be used as a single phase or 3-phase meter (aron, star or delta connection).

Instrument performs the following simultaneous measurements:

- true RMS voltage, current measurements
- system voltage and current and neutral wire current (in 3phase systems)
- 4 quadrant power measurements, phase and total power and power factor
- phase voltage and current crest factor measurement,
- current maximum and power inside integration period.
- frequency and phase angle measurements
- voltage phase sequence (in 3phase systems)
- voltage and current THD and harmonic components (up to 31st component),
- active and reactive energy counting,
- current peaks ,voltage sags and dips and thd peaks.

-power on demand (connecting and disconnecting loads ,for reducing peek power)

Other instrument features:

- direct connection of current inputs or to current transformers with 5 A output (no problems with wiring positioning and burden resistor)
- wide voltage range from 0 V to 500 V, extended with voltage transformers
- active and reactive energy logging (optionally with built in 32kbyts memory ,up to 42 days of integration period of 15 minutes, with time stamp)
- optionally RealTimeClock(RTC) with battery
- 4 opto-insulated configurable digital inputs
- backlight LCD with 4x20 characters
- RS485 communication port compatible with industry-standard MODBUS protocol,
- 2 digital configurable outputs

Standards: EN62053-21:2003-1 Class 1 for static active energy meters; EN62053-21:2003-1 Class 2 for static reactive energy meters; EN 61326 Electromagnetic compatibility (EMC); EN 61010-1 Safety (LVD) CAT II 600V /CAT III 300V

TECHNICAL SPECIFICATIONS

GENERAL:

- **POWER SUPPLY VOLTAGE** — 180 V a.c. ÷ 260 V a.c., 50 Hz/60 Hz
- **PROTECTION CLASSIFICATION** — double insulation
- **POLLUTION / PROTECTION DEGREE** — 3 / IP 40
- **MEMORY / LED** — EEPROM 2Mbits / Digital outputs status indicator (Alarms or Energy pulses or Power demand)
- **OVER VOLTAGE CATEGORY** — CAT II 600 V / CAT III 300 V
- **LOAD** — 5 VA max.
- **DIMENSIONS / WEIGHT** — 1RANM8N = 8 DIN modules - 2RAN968N: 96 x 96 x 105 mm / 0,50 kg
- **TEMPERATURE CONDITIONS** — range 0 °C ÷ +40 °C; humidity range 30 %RH ÷ 75 %RH, non-condensing
- **OPERATION CONDITIONS** — Working temperature range -10 °C ÷ +50 °C. Maximum relative humidity 85 %RH (0 °C ÷ +40 °C), non-condensing
- **STORAGE CONDITIONS** — Temperature range -10 °C ÷ +70 °C
  Maximum relative humidity 90 %RH (-10 °C ÷ +40 °C); 70 %RH (+40 °C ÷ +70 °C)

MEASURING SYSTEM:

- **CONFIGURATION** — 3 voltage inputs
  Voltage input loading: less than 0.1 VA — Line-to-neutral input impedance is 520 kΩ.
  Line-to-line input impedance is 1 MΩ. — Voltage input overload: ×1.2 Un , ×2 Un (for <2 sec)
  3 current inputs
  Current transformer (In= 5A) — Current input loading: less than 0.1 VA
  Current input overload: x2 In , ×40 In (for < 0.5 sec)
- **SYSTEM** — All system with or without current and/or voltage transformers ,balanced or unbalanced load.
  Single phase (1N1E); 3-phase (3-2E, Aaron); 3-phase (3-3E, with no neutral); 3-phase (3N3E, with neutral)
- **MEASURING PRINCIPLE** — TRMS ,4 quadrants, 10 periods, 128 scans/period
- **DISPLAY UPDATE** — 1 update/s, harmonics 1 update/2 s

VOLTAGE:

- **TRMS PHASE TO NEUTRAL VOLTAGE L_X – N, AC**

Nominal input range (V)	Phase to neutral voltage range (V)	Resolution (V)	Accuracy
140 / 280 / 500	0.00 U_N ÷ 0.14 U_N	0.1	±0.6 V
140 / 280 / 500	0.15 U_N ÷ 1.10 U_N		±0.5 V

Starting voltage: 0.01 UN
Voltage crest factor is 1.5 × UN (measuring range). Over-range indication with ↑ ↑ ↑ mark. Over-range indicator appears when line voltage is out-of-range.
Accuracy apply for frequency range 45.00 Hz ÷ 65.00 Hz. Line-to-neutral input impedance is 600 kΩ. Line-to-line input impedance is 1200 kΩ.

- **TRMS PHASE TO PHASE VOLTAGE L_X – L_Y, AC**

Nominal input range (V)	Phase to Phase voltage range (V)	Resolution (V)	Accuracy
140	0.00 U_N ÷ 1.10 U_N	0.1	±(1.0 % + 0.2 V)
280			±(1.0 % + 0.5 V)
500			±(1.0 % + 1.0 V)

Input voltage range: L_X – N = 500 VRMS (single phase); 290 VRMS (3-phase); L_X – L_Y = 500 VRMS

- **VOLTAGE INPUT TRANSFORMATION FACTOR**

Nominal input range (V)	Factor	Comment
0.0 ÷ 140.0	1× ÷ 1279×	140 kV @ 110 V input
0.0 ÷ 280.0	1× ÷ 612×	140 kV @ 230 V input
0.0 ÷ 500.0	1× ÷ 351×	140 kV @ 400 V input

Starting voltage: 0.01 U_N * VTF. Voltage TF and current TF are linked together, their product is limited to 20 MW per phase.

CURRENT:

- **TRMS CURRENT**

Current range (A)	Resolution (A)	Accuracy
0.0 – 0.049	0.001	±0.005 A
0.050 ÷ 6.200		±0.5 %

Starting current: 0.04 IN (=0.02A @ direct 5A input)
Nominal current input range is 0 A ÷ 5 A (IN). Current crest factor is 2.0 × IN. Over-range indication with ↑ ↑ ↑ mark.
Accuracy apply for frequency range 45.00 Hz ÷ 65.00 Hz.

- **CURRENT INPUT TRANSFORMATION FACTOR**

Nominal current range (A)	Factor	Comment
0.0 ÷ 5.0	5 A/5 A ÷ 10000 A/5 A	20 MW max./phase

Starting current: 0.04 IN * CTF (e.g =0.4A @ 5A input through 100/5 current transformer)
Voltage TF and current TF are linked together, their product is limited to 20 MW per phase.
Displayed voltage are max.140 kV (@ max.VTF). Displayed current are max. 10 kA (@ max.ITF).
VTF and ITF product is limited to 20 MW / phase power ,60 MW total power.

FREQUENCY

Frequency range (Hz)	Resolution (Hz)	Accuracy
45.00 ÷ 65.00 (for voltage range 0.15 Un < U)	0.01	±0.04 Hz

POWER AND ENERGIES

- **PHASE ACTIVE POWER (P, Q, S)**

Voltage range * voltage TF * current range * current TF	Resolution (W, VA, VAr)	Accuracy
0.0 ÷ 20000000.0	0.1	±(0.4 %FS + 0.5 % of reading)

- **TOTAL ACTIVE POWER (Pt, Qt, St)**

Voltage range * voltage TF * current range * current TF	Resolution (W, VA, VAr)	Accuracy
0.0 ÷ 60000000.0	0.1	±(0.5 %FS + 1 % of reading)

Accuracy apply for: voltage range 0.15 Un < U < 1.10 Un; current range 0.01 In < I < 1.2 In; power factor 0.40 ÷ 1.00; frequency range 45.00 Hz ÷ 65.00 Hz

- **PHASE POWER FACTOR & TOTAL POWER FACTOR**

PF range	Resolution	Accuracy
0.00 ÷ 0.39	0.01	±0.04
0.40 ÷ 1.00		±0.02

Accuracy apply for: voltage range 0.15 Un < U < 1.10 Un; current range 0.01 In < I < 1.2 In; frequency range 45.00 Hz ÷ 65.00 Hz

- **ACTIVE ENERGY AND REACTIVE ENERGY**

Voltage range * voltage TF * current range * current TF	Resolution (Wh - VArh)	Accuracy
0 ÷ 1.000.000	10	±(1.5 % + 3 dig)

THD & HARMONICS

- **VOLTAGE / CURRENT THD & HARMONICS**

VOLTAGE	CURRENT	Resolution (%)	Accuracy
harmonics U < 0.05 Un	harmonics I < 0.05 Un	0.1	±5 %
harmonics U >= 0.05 Un	harmonics I >= 0.05 Un		±1 %
THD	THD		±1 %

DIGITAL INPUTS/OUTPUTS

- **DIGITAL INPUTS**

Configurable as 40-bit counters triggers (increments of 0.01 ... 100/ pulse of power or any other counting or for counting working hours of external equipment) or as integration period synchronization or tariff selectors (2 or 4 tariffs)

input voltage (max. AC/DC)	25 V
threshold voltage	6 V
input impedance	2.2 kΩ
activation sequence (IP sync.and counters)	LO-> HI -> LO transition (min. 50ms HI pulse width)

- **DIGITAL OUTPUTS**

Configurable as alarms (voltage, current, active or reactive power, freq. out of range), as energy pulse output (0.001 kWh/pulse...1 kWh/pulse) or power demand outputs

switching voltage (max.AC)	25 V
switching current (max.)	1 A
pulse out width	approx. 50 ms
output type	Relay, normally open (N.O.)

MEASUREMENT METHODS

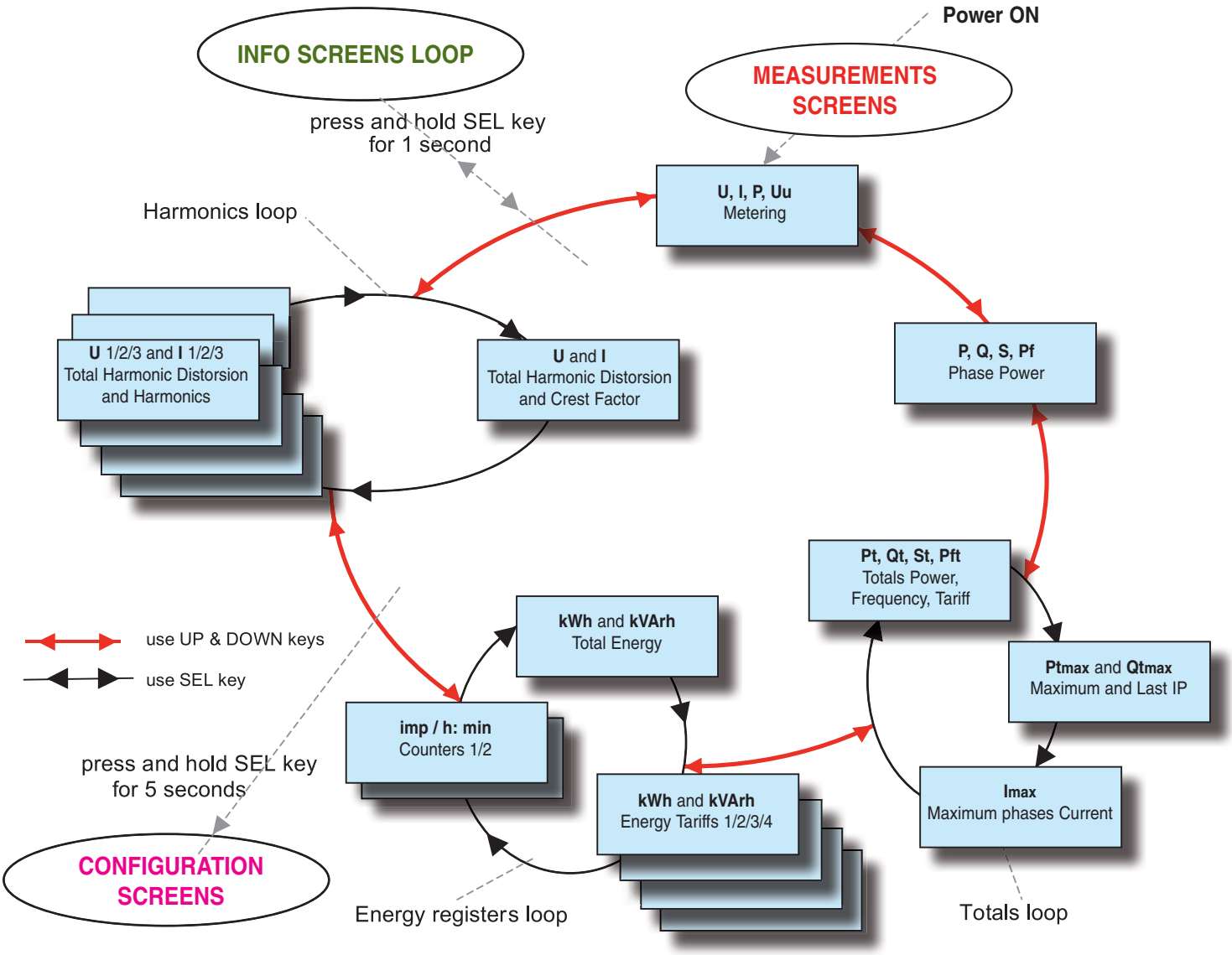
Measurement methods are based on the digital sampling of the input signals. Each input (3 voltages and 3 currents) is sampled 128 times in each input cycle. Sampling frequency depends on the frequency at the synchronisation input (one of the 3 voltage inputs). Sampling period is 200mS (e.g. 10 cycles @50Hz). Basic measured values are calculated at the end of each sampling period. FFT based results are calculated on every 8th input cycle (every 160ms@50Hz).

Measured values (Basic calculations): Phase voltage; Phase current; Phase active power; Phase to phase voltage; Neutral conductor current.

Calculated values (using measured values): Phase apparent power; Phase reactive power; Phase power factor; Phase voltage crest factor; Phase current crest factor; Total active power; Total reactive power; Total apparent power; Total power factor.
In a 3wire systems connection, the following values are not available for displaying: neutral conductor current; phase powers and power factor; crest/thd/harmonics of not applicable signals.

Additional calculation (using FFT transformation): Phase voltage THD; Phase current THD; Phase voltage individual harmonics; Phase current individual harmonics Energy are calculate every 1 second ,based on average power during all sampling periods of 200 mS (e.g. 5 samples periods/second @50Hz). Energy values are in Ws or VArs.

OPERATION - INSTRUMENTS SCREENS LOOPS



MEASUREMENTS SCREENS

```
V  230.8 232.4 229.8
A  2.583 2.622 2.557
W  518.7 542.4 486.0
Vv 399.8 402.5 398.0
```

Metering (U, I, P, Uu)
Phase Voltage, Current, Power and phase to phase Voltage

```
W   518.7 542.4 486.0
VA  596.2 609.4 587.6
VAr 293.9 277.8 330.2
Pf  0.87i 0.89i 0.84i
```

Phase Power (P, Q, S, Pf)
Phase Active, Reactive, Apparent Power and phase Power Factor (not available in 3wire and Aaron connection)

```
TOTAL 4w  TR1   13/15m
kW  1.547
VA  1.791 50.02Hz   L1
Var 0.902 PfT    0.86I
```

Totals (Frequency, Tariff, Pt, Qt, St, Pft)
Total Active, Reactive, Apparent Power and Total Power Factor, Type of connection, Frequency, current Tariff, remain/selected IP time

```
KW+     max.    1.97
KVAr+   max.    1.04
KW+     lst.    1.63
KVAr+   lst.    0.98
```

Maximum and Last IP Power
Maximum average Active Positive and Reactive Power in any IP and in Last elapsed (based on accumulated IP energy/IP time)

```
I1 max.     2.981 A.
I2 max.     3.018 A
I3 max.     2.756 A
```

Maximum IP Current
Maximum average Current in any IP

```
kWh+  tot >00001207.83
kWh-  tot  00000000.00
kVArh+tot >00000990.42
kVArh-tot  00000000.00
```

Energy (total/sum. of all tariffs)
cursor (>) is on current Active Energy counter

```
kWh+  TR1  00000807.35
kWh-  TR1  00000000.00
kVArh+TR1  00000690.26
kVArh-TR1  00000000.00
```

Energy in tariffs 1 to 4 screens (example for tariff 1)
Number of screens depend of selected number of tariffs (2 or 4)

```
Count.1:    00000101.50
          inc/imp:0.50
Count.2:    0000010h52m
          inc/imp: time
```

Counters
Counter 1 is configured as input pulse counter (pulse weight is 0.50)
Counter 2 is configured as time counter (measure working time of external device activity)

```
Uthd 3.45  3.26  3.78
UCRf 1.40  1.46  1.42
Ithd 5.18  6.02  4.59
ICRf 1.78  1.83  1.80
```

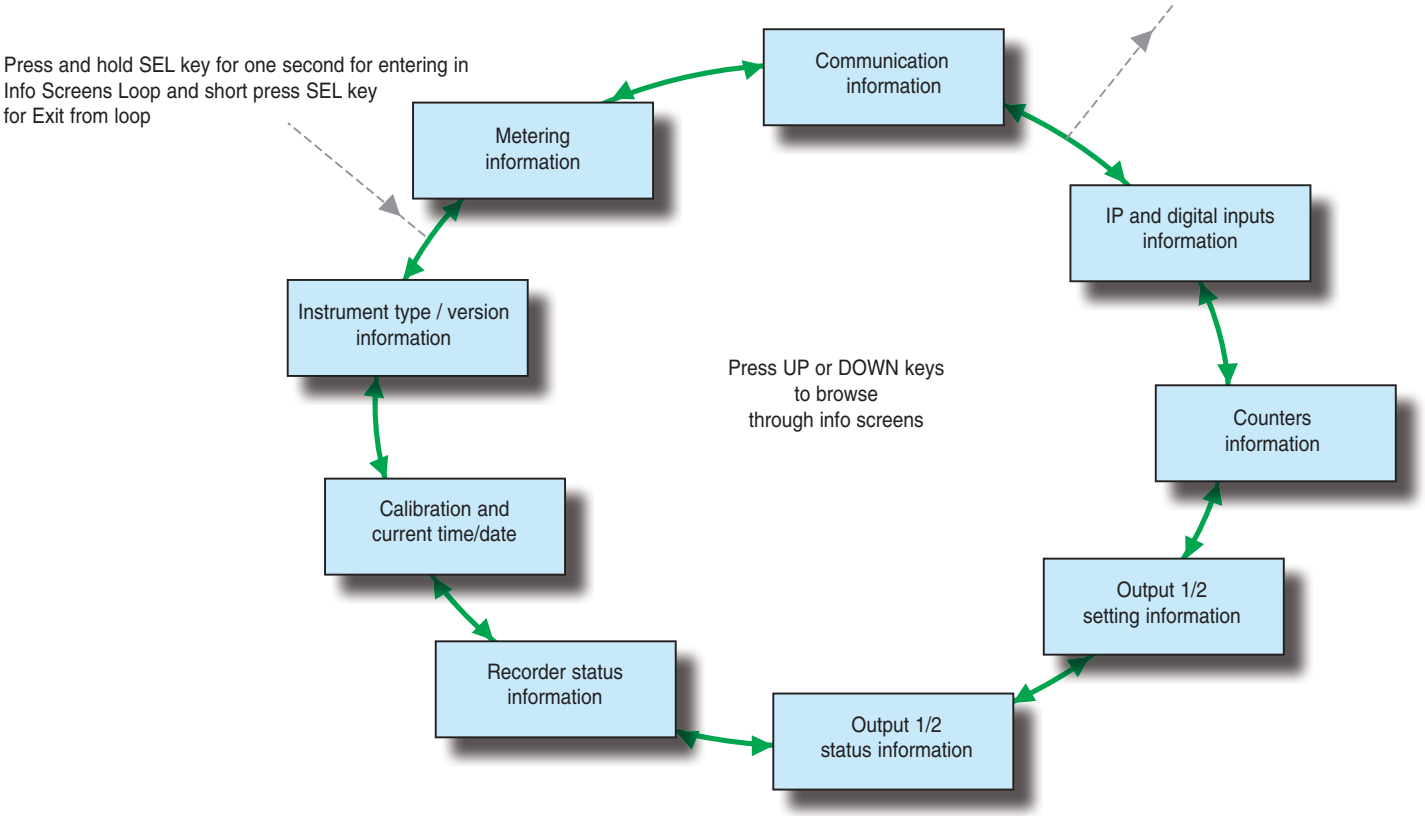
Voltage and Current Total Harmonics Distortion (thd) and Crest Factor (CRf)

```
U1:  230.8 V thd:  3.45
 h3:  3.12   h5:  0.61
 h7:  0.18   h9:  0.02
h11:  0.08  h13:  0.00
```

Voltage or Current Harmonics (example for U1)
Displayed are odd harmonics (h3 ...h13)
All harmonics (h2...h31) are available through MODBUS protocol communication.

INFO SCREENS LOOP

For quickly reviewed/checked instrument setting ,without to enter in configuration menu, press and hold SEL key for 1 s in any measurement screen. When first information screen is displayed use UP and DOWN keys to browse through instrument settings (abbreviations have the same meaning as in corresponding configuration screens). Instrument automatically returns from info to measurements 10 seconds after last keys activity.


Press and hold SEL key for one second for entering in Info Screens Loop and short press SEL key for Exit from loop
Communication information
Metering information
IP and digital inputs information
Instrument type / version information
Press UP or DOWN keys to browse through info screens
Counters information
Calibration and current time/date
Output 1/2 setting information
Recorder status information
Output 1/2 status information

```
  R E V A L C O
3ph Energy Analyzer
 RANM8  ver.: 436/1
  ser.no: 00000000
```

Instrument information screen
Manufacturer type, version and serial number of instrument

```
Volt.range:    280 V
Voltage TF:      1 x
Current TF:    5/5A
Conn: 4wire
```

Metering system information screen (example)
Voltage range, Voltage and Current Transformers Factors and type of measurement connection

```
Comm.mode:   MODBUS
Net.addr.:        1
Baud.rate:     9600
```

Communication information screen (example)
Communication setting, net address and speed

```
Energy tariffs:   2
IPsync.:     input3
IPlength:   15 min.
IPremain:   11 min.
```

IP and digital inputs information screen (example)
Selected number of Tariffs, source for Tariffs synchronization, IP length (presetted and remain)

```
Count.1:  STOP
inc/imp:   0.01
Count.2:  RUN
inc/imp:  time
```

Input counters information screen (example)
Counter status, increment factor and mode (pulse or time counter)

```
Record.stat:   STOP
Lap rec.no.:      0
Lap occurred:    No
FreeLapRec:     191
```

Recorder status information screen (example)
Recorder status, number of stored records and info of available free records before lap (circular buffer behavior)

```
Out1: alarm>> [OFF]
Ref.inp.:         I1
Ref.val.:  55.00  A
Delay: 05s
```

Output 1 information (example)
Current output status (OFF/ON), output mode and information depended about selected mode

```
Cal.date: 10.08.08
Current date/time:
 29.04.09 15:28:34
```

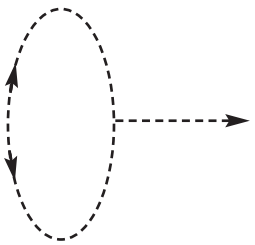
Calibration and current instrument date/time
Current time/date only on instruments with build in Real Time Clock

CONFIGURATION SCREENS

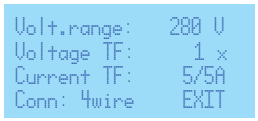
To enter in configuration press and hold SEL key for 5 s in any measurement screen.
Use UP and DOWN keys to select configuration submenu and press SEL. In selected configuration submenu use SEL key for selecting one of available parameters and adjust/modify it with UP and DOWN key. For exit from submenu to main configuration menu and for exit from main configuration menu to measurements, select EXIT and press UP or DOWN. Instrument automatically returns from configuration menu to measurements 3 minutes after last keys activity.

```
  Exit
> Metering system
  Communication.
  Digital inputs.
  Inputs counters
  Digital output 1
  Digital output 2
  Clear regs./counts.
  System settings
  Recorder settings
```

Main configuration screen
UP and DOWN key to move cursor and/or scroll screen through all configuration options.



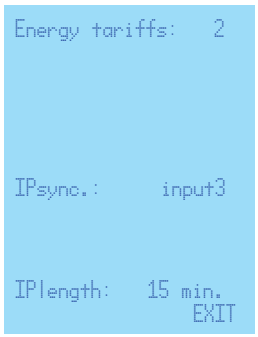
SEL key to enter in selected submenu
Select EXIT for return in measure



Metering system configuration screen
= Voltage range 140V, 280V or 500V
= Voltage Transformation Factor
= Current Transformation Factor
= select connection, 4wire, 3wire or Aaron

Maximum value of Voltage and Current Transformation Factor are in interaction and depend of voltage range and max power (20MW per phase, 60MW total)

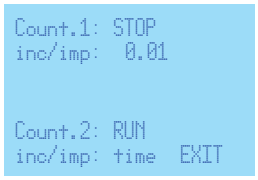
Communication configuration screen
= select MODBUS or OFF
= select network address from 1 to 247
= select communication speed 4800 or 9600



Integration period (IP) and digital inputs configuration screen
= select no.of tariffs , 2 or 4

input 1	input 2	tariff no.
OFF	OFF	1
ON	OFF	2
OFF	ON	3
ON	ON	4

= select source for IP synchronization, internal timer, input 2, input 3 or remote through MODBUS (internal timer is always active in conjunction with selected synchronization source)
= select IP time length (10, 15, 20, 30 or 60 min)

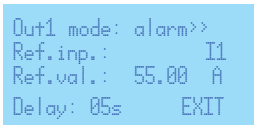


Input counters configuration screen
= select STOP or RUN
= select increment factor of counter on every input pulse or select time for counting time (hours|minutes) of input activity.
= select STOP or RUN
= select increment factor of counter on every input pulse or select time for counting time (hours|minutes) of input activity.

Counter 1 is connected on input 3, counter 2 on input 4.
If IPsync: input 3, counter 1 count IP periods.

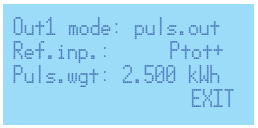
Recorder status configuration screen
= select STOP or RUN
= select active energy for recording
eP+, positive active energy
eP-, negative active energy
eP+/-, positive and negative active energy
= select reactive energy for recording
eQ+ , positive reactive energy
eQ- , negative reactive energy
eQ+/-, positive and negative reactive energy

If user STOP and RUN recording with different energy selected, instrument prompt warning message before execute/store new settings with deleting old/previous records.



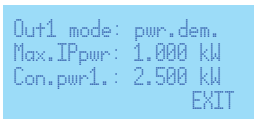
Output 1 and Output 2 configuration screen (example for alarms)
= Out 1/2 mode: select output function (***see table**)
= select reference signal (***see table**)
= select reference signal value (alarm threshold)
= select output action delay (1..12 seconds) (minimum condition time)

Alarm is signaled if reference quantity (ref.inp.) is equal/higher or lower than preset value. Output relay is closed as long as such condition lasts or for minimum condition time



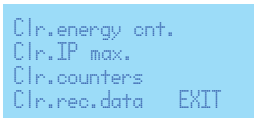
Output 1 and Output 2 configuration screen (example for pulse out)
= Out 1/2 mode: pulse output (for ext. energy counter)
= Total Active Positive Energy
= select pulse weight (amount energy per pulse)

Output relay is closed for approx. 50 ms whenever predefined energy value is reached



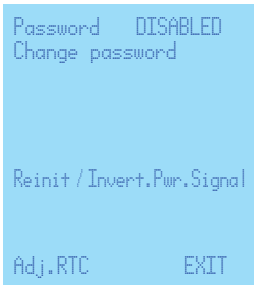
Output 1 and Output 2 configuration screen (example for Power demand)
= Out 1/2 mode: Power demand
= select maximum Power in IP time
= select power of controlled load (connected on output 1/2)

Output relay is closed if Power trends is lower than preset value (MaxIPpwr). Relay goes into open state if IP Power trends go higher than preset value. Connection Power (Con.pwr.) is set for each output independently. Instrument checks Power on each input every minutes and will disconnect only one load if calculation shows this is adequate (output 1 has priority) and same when the possibility to reconnect any of the loads.



Clear registers / counters screen
= clear Energy counters, Total and Tariff Energy
= clear IP max Power and max Current registers
= clear Counter 1 and 2
= clear Energy recorder data/memory

If recorder memory in not empty instrument prompt warning and clear confirmation message.



System settings screen
Password / Change password
User can disable or enable or change password for entering in configuration screens. This action always required entering current password. Password are four keys (or double keys) sequence. Initial password is four SEL keys.
= toggled on pressing SEL key
Reinit = load default parameters (see default table)
Invert. Pwr. Sign. = inverting powers signs
= adjust instrument time/date
(only on instruments with build on Real Time Clock)

Adjust current instrument date/time (with build on Real Time Clock only)
Use SEL key for moving cursor on desired date/time part and adjust using UP/DOWN keys. Select EXIT for save changes and exit.

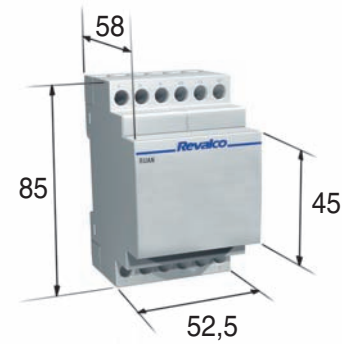
Ouput mode	Reference signal	Referred value units
alarm >> (alarm ON, higher or equal the setted value)	see table	
alarm >> (alarm ON, lower the setted value)	see table	
pulse output (Energy pulse out)	Ptot+ (Total Active positive Energy)	Wh, kWh ,MWh
Power demand	Ptot+ (Total Active positive Power)	
OFF (force OFF status)	-	
ON (force ON status)	-	

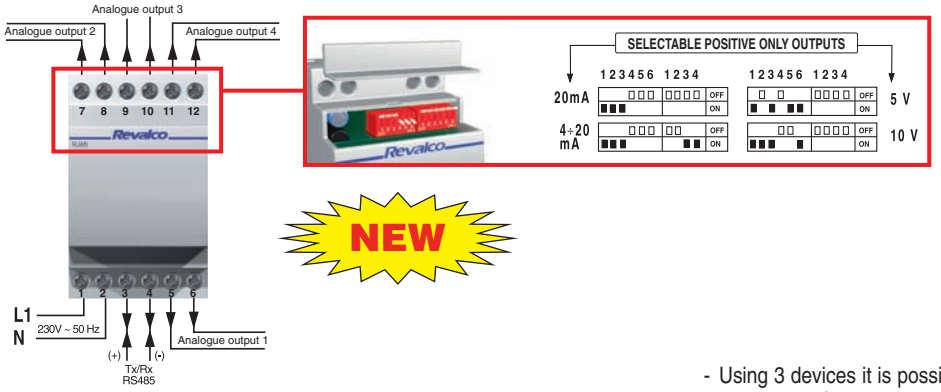
Reference signal		Referred value units
Ptot+	Total Active positive Power	W ,kW ,MW
Qtot+	Total Reactive positive Power	Var ,kVAr ,MVAr
I1	Current on line/phase1 (I1)	A ,kA
Ix	Current on any line/phase (I1 or I2 or I3)	A ,kA
U1	Voltage on line/phase1 (U1)	V ,kV
Ux	Voltage on any line/phase (U1 or U 2 or U3)	V ,kV
Freq	Frequency	Hz

ANALOGUE OUTPUT MODULES

1RUAN3

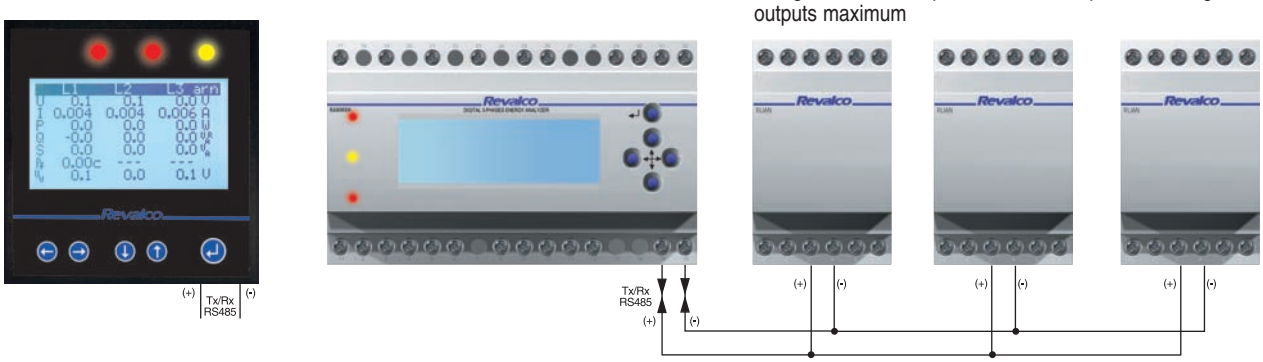
- With this three modules device it is possible to select four **positive** DC outputs only, between 0-20mA; 4/20mA: 0-10V; 0-5V through the minidips situated under the cover
- 2 outputs are galvanically insulated from the other 2 and all are galvanically insulated from output RS485





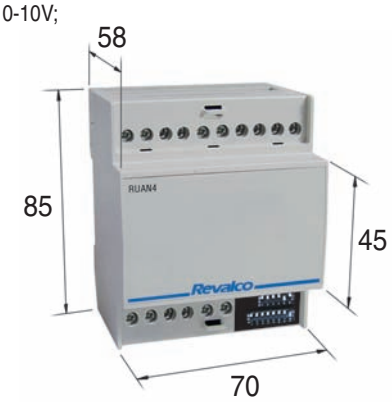
NEW

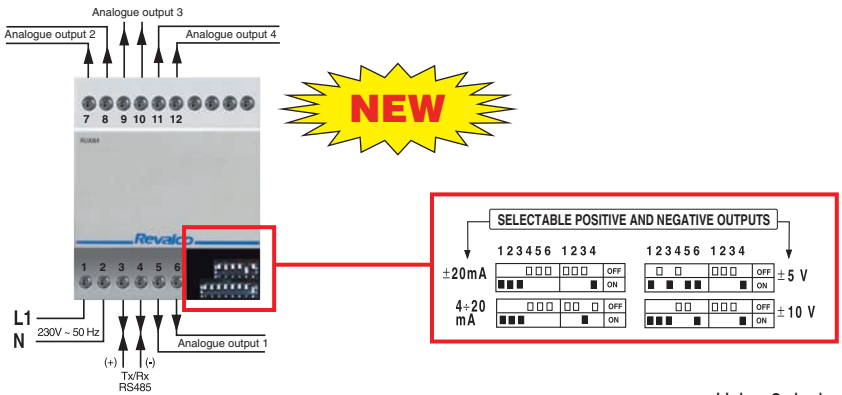
- Using 3 devices it is possible to have up to 12 analogue outputs maximum



1RUAN4

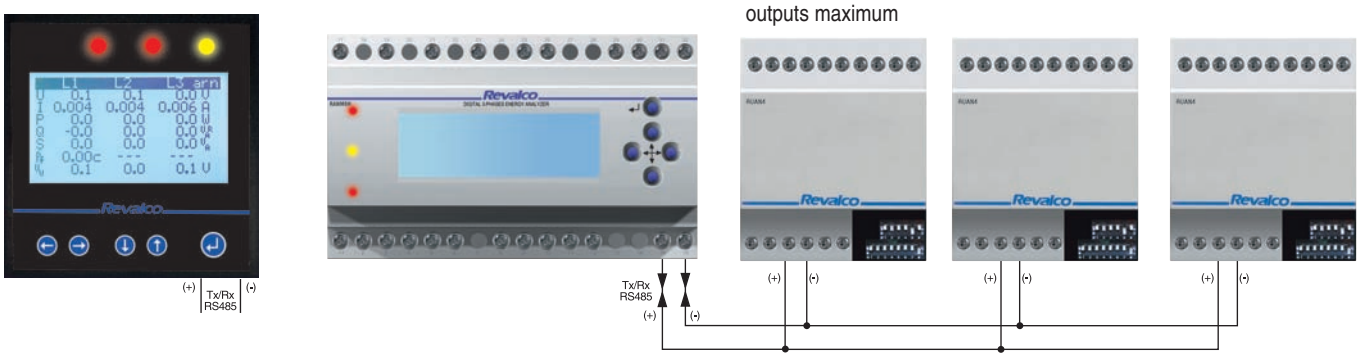
- With this four modules device it is possible to select four **positive and negative** DC outputs, between 0-20mA; 4/20mA: 0-10V; 0-5V through the minidips situated under the cover
- 2 outputs are galvanically insulated from the other 2 and all are galvanically insulated from output RS485.
- Using 3 devices it is possible to have up to 12 analogue outputs maximum





NEW

- Using 3 devices it is possible to have up to 12 analogue outputs maximum



LED MULTIFUNCTION METERS - TRUE RMS

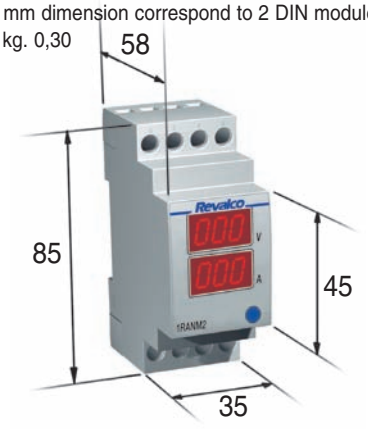
SINGLE PHASE

1RANM2 1RANM2CT

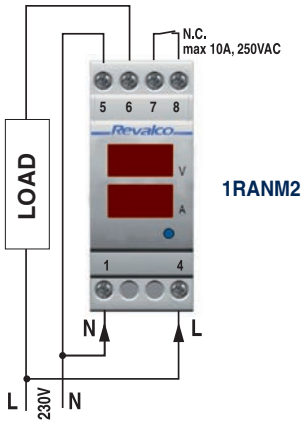
- Two display 3 digit each
- Easy and immediate reading without possible incomprehensions or further elaborations.
- The use of one button only permits to change the measurements pages in natural way.
- During the program phase, the instrument shows the different possibilities present in the device, so it is not necessary to have in hands the user's manual all the time.
- The "power supply" page can be used in all the cases on which is important **the information of "power supply loss"** (e.g. in refrigerating machines and/or cold storage).
- The 2 modules dimension is the right compromise between the necessity to reduce the space and a good readability of measurements that it is one off the main scope in an electrical net.
- The possibility to reset the energy and contemporary the hour/minutes value permits, in easy way, to see the relative consumption in a fixed time.
- **1RANM2 model is usable as priority relay 16A**

DIMENSIONS in mm

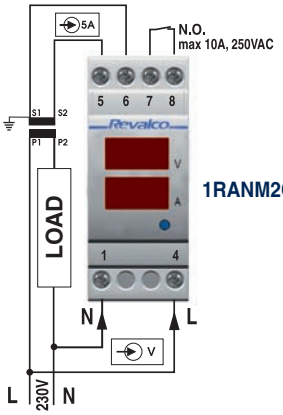
The 35 mm dimension correspond to 2 DIN modules
Weight kg. 0,30



CONNECTION DIAGRAMS



1RANM2



1RANM2CT

TECHNICAL CHARACTERISTICS

		1RANM2	1RANM2CT
- **PARAMETERS**			
- Ph-N voltage	V	●	●
- Current (direct connection)	A	●	
- Current (connection by means of C.T.)	A		●
- Power factor	ind/cap	●	●
- Apparent power	PVA		●
- Active power	PW	●	●
- Reactive power	Pvar		●
- Frequency	Hz		●
- Active Energy (resettable capacity)	kW/h	●	●
- Reactive Energy (resettable capacity)	kvar/h		●
- Partial working time (resettable capacity)	hh	●	●
- Acoustical pre-alarm		●	
- **OUTPUT RELAYS** (contact 250V-2500W) selectable on principal measures (V-A-Hz-Pw)		**N.C.16A**	**N.O. 10A**

Auxiliary power supply

- nominal value U AUX	230V 50/60 Hz
- range	0.9...1.1 UAUX
- max absorbed power	2 VA

Input voltmeter circuit Ph-N voltage

- direct insertion (Ph-N)	max 300 V
- permanent overload	120%
- thermic overload (1 s)	150%
- input impedance of voltmeter circuit	1,5MΩ Ph-N

Input ammeter circuit

- current:	direct insertion	max 32A
	insertion by means of C.T.	5A
- permanent overload		120%
- thermic overload (1 s)		200%
- range adjustment, CT ratio		5...999

Voltage measurement range

- VLN measurement range (voltage phase, direct insertion)	0...250 V
- accuracy class	0.5% f.s ± 2 digit

Current Measurement range:

- measurement range:	
direct insertion	0,1...26A
accuracy class on range 0,1... 26A	0.5% f.s ± 2 digit
- measurement range:	
insertion by means of C.T.	0,05...5A
accuracy class on range 0,05...5 A	0.5% f.s ± 2 digit

Frequency Measurement range:

- nominal value	50/60Hz
- range	45...65 Hz
- accuracy class	0.3% vm ± 1 digit
- response time	< 300mS

Active Power

- range	direct insertion	8 kW
	insertion by means of C.T.	500 kW
- accuracy class		1% f.s ± 2 digit

Reactive Power

- range	250 kvar
- accuracy class	1% f.s ± 2 digit

Apparent Power

- range	250 kVA
- accuracy class	1% f.s ± 2 digit

Active Energy (Wh)

- resettable visualization		Two separate
- calculating period		15 minutes
- energy counting	direct insertion	9,99 / 999 kWh
	insertion by means of C.T.	9,99 / 999 kWh
- accuracy class with current 0,05...1.0 In		2% fs ± 2 digit

Reactive Energy (varh)
- energy counting resettable 9,99 / 999 kvarh
- calculating period 15 minutes
- accuracy class with current 0.05...1.0 In 2% fs ± 2 digit

Power Factor
- range cosφ 0...1...0
- accuracy class with current 0.1...1.0 In and voltage 0.8...1.2 Un 2% fs ± 2 digit

Working time
- Partial working time hh:mm (from previous reset)

Digital filter
- Average 1...15

Compatible current transformers
- Nominal current 5 A
- Ratio 1...200

Visualization
- display 2 numerical lines
- number of characters 6 on two lines
- colour RED

Mechanical characteristics
- mounting on DIN rail DIN50022
- protection IP20/ frontal IP30

Electrical characteristics, options Galvanic insulation
- alarm relay coil-contact 3kV

Relay characteristics (1RANM2)
- **N.C.** contact maxV....maxI....maxP 250VAC,**16A** (resistive load), 2500W

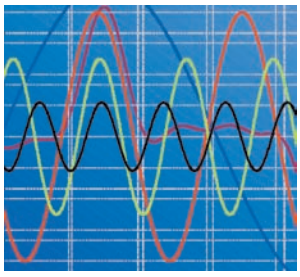
Relay characteristics (1RANM2CT)
- **N.O.** contact maxV....maxI....maxP 250VAC,**10A** (resistive load), 2500W

When loads more than 10A are present, it is necessary to use (relays) auxiliary contactors

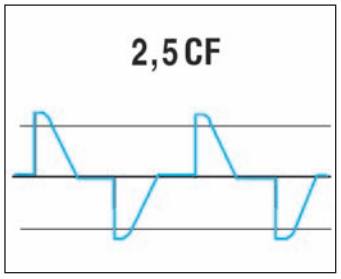
Environment conditions
Ambient temperature:
- nominal temperature 0...+45 °C
- range -5...+55 °C
- storage temperature -10...+70 °C
- humidity 10...95 %
- atmospheric pressure 70...110 kPa

Standards CEI
- Safety CEI EN 61010-1 300V CAT III
- Accuracy class CEI EN 60688
- Electromagnetic compatibility (immunity) CEI EN 61000-6-2 (ex EN 50082-2)
- Electromagnetic compatibility (emission) CEI EN 61000-6-4 (ex EN 50081-2)
- Protection IP CEI EN 60529

MEASUREMENT'S TYPOLOGY



True RMS up to the 20th harmonic wave

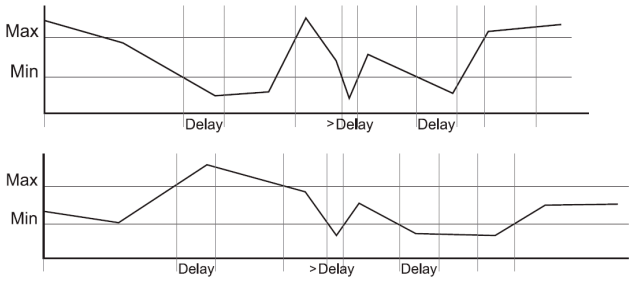


Crest factor up to 2,5 (Voltage and Current)

ALARM RELAYS

One relay with normally closed or normally open contact.
Possibility to set the interventation threshold:
- "Hi" more of .... (>) and "Lo" less of... (<)
- delayed to the excitation " _ - ¯ " or to the disexcitation " ¯ - _ "

MEASURE'S CHANEL TO WHICH THE THRESHOLD IS REFERRED:
- min or max line Voltage
- min or max line Current
- min or max Frequency (1RANM2CT only)
- min or max Active Power



USABLE AS:
- **motor protection**
- **overload**
- **low consumption**
- **not presence of phase**
- **priority relay**
- **anomaly of frequency**
- **high consumption**
- **min voltage**

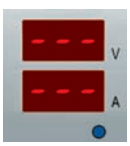
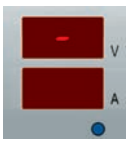
1RANM2

- Single phase multifunction meter direct insertion, 230V - 26A (usable on domestic homes and low loads)
- Instrument furnished already calibrated with the following data:
  selected cource = ACTIVE POWER
  maximum threshold = 4,0 kW
  acoustic alarm = 8 sec
  time isteresis = 10 min

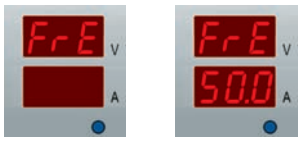
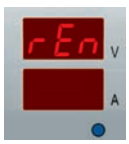
1RANM2CT

Single phase multifunction meter by means of CT, 230V - from 5A to 1000/5A (for industrial use)

OPERATION: Measurements displaing.
The measurements and signalling pages which appear (pushing and releasing the frontal button) are the following:

PUSHED BUTTON	RELEASED	DESCRIPTION
		This FLASHING signal appears only if: - this page is selected as "default page" (see the correspondent configuration chapter) and the instruments is just light-on or if the auxiliary supply failed, immediately light-on or the parameters configuration is finished. After the changement of this page, it disappears from the selection pages.
"Blank" page		This page is selected in case of the display's light is extremely high; selectable as "default page" also. The sole line light-on, means that the device is in any case working.
voltage / current		On the upper line the value of the voltage (V) is displayed. On the downer line the value of the current (A) is displayed.

On the upper line the value of the voltage (V) is displayed.
On the downer line the value of the current (A) is displayed.
The decimal point is in function of the selected CT value.
100/5A = 99.9 indication
over 100/5A = 999 indication

PUSHED BUTTON	RELEASED	DESCRIPTION
		On the downer line the value of the frequency (Hz) is displayed with one decimal resolution
frequency		
		On the downer line the value of the Active Power (kW) is displayed. 1RANM2 model has always the centesimal resolution (<9,99 kW max) Active Power can be POSITIVE or NEGATIVE depending by the sense of the current. If a red point (in the lower part of the extreme right) is light-on, it means that the value is NEGATIVE. **It is necessary to verify the corrent insertion of the instruments.**
active power		
		Power Factor (Cos φ). It is the Phase displacement between voltage and current. When the showed value is 1,00 PF indication means that the phase displacement is ZERO (not capacitive or inductive but resistive only).
		Phase displacement is POSITIVE (current is delayed to the voltage = Inductive).
		Phase displacement is NEGATIVE (voltage is delayed to the current = Capacitive). **It is necessary to verify the corrent insertion of the instruments.**
power factor		
		On the downer line the value of the Reactive Power (kvar) is displayed, with or without decimal points (decimal or centesimal resolution). The Reactive Power can be POSITIVE or NEGATIVE like the Power Factor (Cos φ). If a red point (in the lower part of the extreme right) is light-on, it means that the value is NEGATIVE. **It is necessary to verify the corrent insertion of the instruments.**
reactive power		
		On the downer line the value of the Apparent Power (kVA) is displayed, with or without decimal points (decimal or centesimal resolution). Apparent Power is always positive (Vrms x Irms).
apparent power		
		On the entire display the Active Energy (kWh positive and/or negative) value appears, 6 numbers. The example shows 134.261 kWh. To grant long duration of the instrument's memory, automatic backup is effected every 15 minutes. **If the instrument is light-off, the sum related to the last 15 minutes can be losed.** ⚠ The sum can be resetted by a long pressure of the frontal button. The value starts to flash, and after few seconds the numbers show permanentely ZERO.
active energy		
		On the entire display the Reactive Energy (kvarh positive and/or negative) value appears, 6 numbers. The example shows 1583 kvarh. To grant long duration of the instrument's memory, automatic backup is effected every 15 minutes. ⚠ **If the instrument is light-off, the sum related to the last 15 minutes can be lossed.** The sum can be resetted by a long pressure of the frontal button. The value starts to flash, and after few seconds the numbers show permanentely ZERO.
reactive energy		
		On the entire display the Partial Hour-counter(hh) appears, 6 numbers. The example shows 4.320 hours from the last zeroing. To grant long duration of the instrument's memory, automatic backup is effected every 15 minutes. **If the instrument is light-off, the sum related to the last 15 minutes can be losed.** ⚠ The sum can be resetted by a long pressure of the frontal button. The value starts to flash, and after few seconds the numbers show permanentely ZERO.
partial hour-counter		

PUSHED BUTTON	RELEASED	DESCRIPTION
		Situation of output relay Off = rest relay (closed contact), **this situation is present with light-off instrument**
		On = Active relay (open contact) Note: all the pages flash during the interventation of threshold The showed light point shows that the interventation condition is present. This point light-on on all the other pages too.

output situation

- The activation of relay is evidenced by the display's flash, every page is displayed.
  The threshold intervention can be delayed during the configuration phase.
  The immediate overpassing of the selected value is displayed by the presence of a red point situated on the extreme right of the upper diplay, contemporary an acoustic alarm (pre-alarm) is emitted. This acoustic signal continue until the interventation of the relay.

  The acoustic alarm is always inhibited within the firts 10 seconds starting from the powering of the device. ⚠

1RANM2 | 1RANM2CT

PROGRAMMING: Make a long pressure (4 seconds about) on the frontal button staying in a page where the reset of parameter is not allowed.
So not on the pages of Energy and Hour-counter.

The following page appears: the flashing point means that it is possible now the configuration.

After 4 seconds the pages with configuration parameters start to be displayed; one page every 4 seconds showing the actual selected value.
If it is necessary to see the values without any modification don't touch nothing until the automatic end of the showed pages.

To change the values of parameters, it is enough to press the button while this parameter is displayed.
The value change immediately and closed to him a flashing point appears meaning that the value is in modification phase.
To fast forward maintain pressure on the front button. When the needed value is displayed release the button and after 4 seconds the further parameter appears, the modified value is automatically saved permanentely.

DEFAULT PARAMETER	POSSIBLE VALUES	DESCRIPTION
		Output will be activated when the value of selected measure will be HIGHER than the value of selected threshold (MAX THRESHOLD). Default setting.
		Output will be activated when the value of selected measure will be LOWER than the value of selected threshold (MIN THRESHOLD).
		Output will be NEVER activated. In this case, all the parameters related to the threshold CANNOT be displayed, so not settable

threshold mode

AVAILABLE IF tSh IS DIFFERENT FROM OFF ONLY 		The delay time will be applied to the ACTIVATION, the output light-off after the programmed delay time only. (DELAYED TO THE EXCITATION).
		The delay time will be applied to the DEACTIVATION, the output light-off after the programmed delay time only. (DELAYED TO THE DISEXCITATION).

delay setting

AVAILABLE IF tSh IS DIFFERENT FROM OFF ONLY 	VALUE from 0 to 999	It is the delayed value with which the alarm contact come back to the close situation after an eventual interventation. It is particular usefull to avoid continuous interventations of the device. Esxpressed in seconds. Default setting = 600

delay

	1RANM2	1RANM2CT

DEFAULT PARAMETER	POSSIBLE VALUES	DESCRIPTION	
AVAILABLE IF tSh IS DIFFERENT FROM OFF ONLY max sound duration	VALUE from 0 to 255	It is the delayed value with which the alarm contact works after the overpassing of the selected level. This acoustic signal (pre-alarm) is always present together with the delay. Default setting = 8	
AVAILABLE IF tSh IS DIFFE-RENT FROM OFF ONLY threshold source		 VOLTAGE threshold. CURRENT threshold. ACTIVE POWER threshold. Default setting.	 VOLTAGE threshold. CURRENT threshold. FREQUENCY threshold. ACTIVE POWER threshold.
AVAILABLE IF tSh IS DIFFERENT FROM OFF ONLY threshold value		 "Src" selected for VOLTAGE. Selection range from 0 to 999 V without decimal points. "Src" selected for CURRENT. Selection range from 0 to 99,9 A "Src" selected for ACTIVE POWER. Selection range from 0 to 99,9 kW (decimal point depends by the Power value). Default setting = 2,80 kW	 "Src" selected for VOLTAGE. Selection range from 0 to 999 V without decimal points. A"Src" selected for CURRENT. Selection range from 0 to 999 A with or without decimal point depending by the selected CT "Src" selected for FREQUENCY. Selection range from 0 to 99,9 Hz with decimal point. "Src" selected for ACTIVE POWER. Selection range from 0 to 99,9 kW (decimal point depends by the Power value).
  average	VALUE from 1 to 15	It is the number (n) of single measures effected on the electrical parameter before it's visualization on the display. Practically it is the filter of the measure stabilization. The numbering rise up from 1 to 15; more higher is the selected number, more slow are the eventual variations of reading. This is valid for all the measured parameters.	
  Default page	ONE OF THE AVAILABLE PAGES	Select the main page that you want to see after the initial powering of the instrument.	
  current transformer secondary 5A	VALUE from 5 to 999 every 5 steps		Select the ratio .../5A of the current transformer.

THREE PHASE

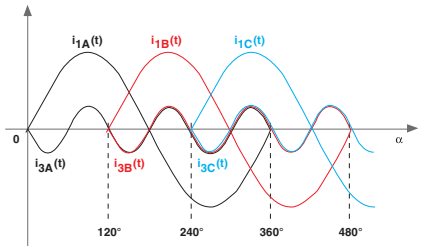
+ OPTION "SPLIT CURRENT CT"

1RANM23

2RAN72C - 2RAN72C485

2RAN9696C - 2RAN9696C485

- 2 modules DIN (the smaller present on the market) is the best solution in order to save space on cabinets and in meantime to have a good readability of measures; main scope of multifunction meters in an electrical net.
- Nine red leds with high intensity on three lines, permit to show 3 measurements at the same time.
- Two buttons on front permit to change the measurement pages easily and in natural way.
- During the setting phase, the instrument shows the different possibilities present in the device; so it is not necessary to have in the hands the user's manual all the time.
- "Power supply" page can be used in all the cases on which is important the information of **"lost power supply"** (example in refrigerating machines and/or cold storage)
- The possibility to reset the energy consumption and time, permits to show in easy way the relative consumption in a certain time
- **Current on neutral wire:** meaning of $I_{unbalanced}$ measurement (unbalanced current). It is frequent now, also in normal distribution nets, the use of devices on which the load is not linear. With the scope to calculate correctly the neutral cable and to verify the correspondence with the project data, measurement of current on neutral (or unbalanced current measure) become fundamental.
  These loads absorb not sinusoidal currents, generating harmonic waves as consequence. Third harmonic waves and their multiples, in a 3phase system, are in phase between them constituting homopolar terns.
  In a 4 wire systems these homopolar terns (I_o) makes an aritmetical sum and go along the neutral cable; as result the current on it is: $I_{no}=3*Io$. So, as example, a third harmonic component I3, present on 3 phases with amplitude 40% respect to the fundamental, causes on neutral a current higher than the fundamental (1,2*Inom)
  It was in the past a rare situation. Current on neutral was caused principally by the unbalanced loads and the solution was to calculate the section of neutral cables equal or less to the phase cables section.
  Now the standard CEI 64-8 art. 524.3, explain well that: neutral cable in multiphase circuits, on which the phase cables have section more than 16mm² (copper wire) or 25mm2 (aluminium cable), can have less section (min 16mm² or 25mm² in any case) on condition that the section supports the current present on neutral: **unbalanced current added of eventual harmonic waves**, Our device 1RANM23 is able to measure this current.

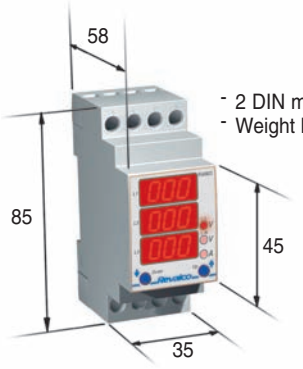


True RMS measurements reading up to 20th harmonic wave

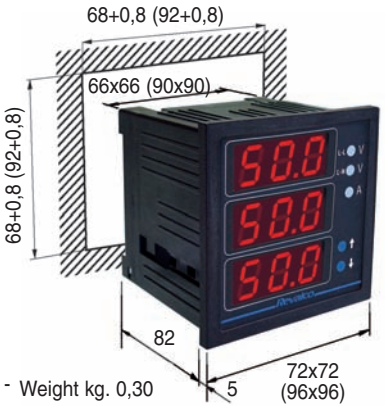
2RAN72C...C100
2RAN9696C...C100

These codes (....-C100) are supplied together with a mini split core transformer in class 1 able to measure **up to 100A** and powers up to 23kW single phase. This solution permits a quick installation in already existing panels or nets as that it is not necessary to disconnect the power cable as needed by the classic current transformers. This CT accepts a cable diameter 12mm.

DIMENSIONS in mm

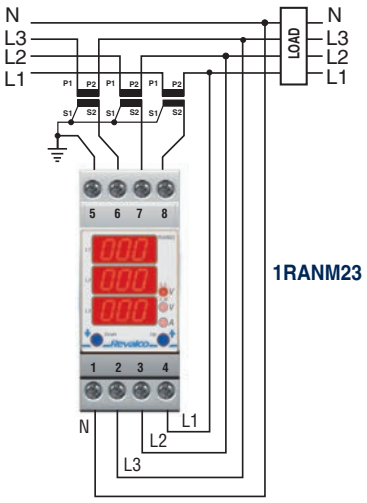


- 2 DIN modules
- Weight kg. 0,30

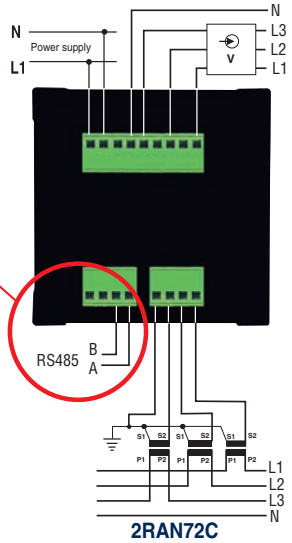


- Weight kg. 0,30

CONNECTION DIAGRAMS

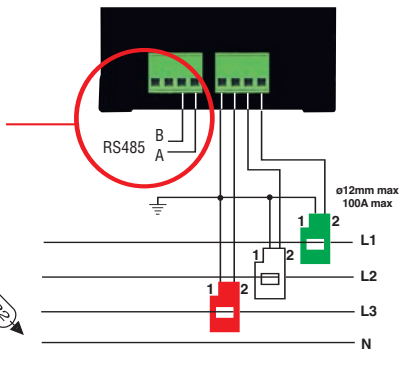


1RANM23



Option for model
2RAN72C485
2RAN9696C485

2RAN72C
2RAN9696C



Option for model
2RAN72C485...C100
2RAN9696C485...C100

2RAN72C....C100
2RAN9696C....C100

TECHNICAL CHARACTERISTICS

- Ph-Ph voltage	VL1, VL2, VL3
- Ph-N voltage	VL1-N, VL2-N, VL3-N
- Medium voltage of phase	medium VL
- Phase current	I1, I2, I3
- Medium current of phase	medium I
- Current on neutral	Iun (< unbalance >)
- Phase Active Power (+/-)	L1, L2, L3
- Total Active Power (+/-)	Pw
- Phase Reactive Power	L1, L2, L3
- Total Reactive Power	Pvar
- Phase Apparent Power	L1, L2, L3
- Total Apparent Power	Pva
- Total Active Energy (import)	+kW/h*
- Total Active Energy(export)	-kW/h*
- Total Reactive Energy	kvar/h*
- Total and Partial working time	hh:mm*
- Phase Power Factor	ind/cap L1, L2, L3
- Total Equivalent Power factor	Total ind/cap
- Frequency	Hz
- Sequence of phases	L1>L2>L3 (symbol only)
- Phase-neutral Asimmetry voltage	(>L1 L2 L3-N) - (<L1 L2 L3-N)

*resettable parameters

Auxiliary power supply

- nominal value U AUX	230V 50/60 Hz selfsupplied
- range	0.6...1.1 Uaux
- max absorbed power	2 VA

Input voltmeter circuit Ph-Ph voltage

- direct insertion	max 500 V
- permanent overload	120%
- thermic overload (1 s)	150%
- input impedance	2MΩ Ph-N/Ph-Ph

Input ammeter circuit Current:

- nominal current	5 A
- permanent overload	120%
- thermic overload (1 s)	200%
- range adjustment, CT ratio	5…1000

Voltage measurement Range:

- VLN measurement range (voltage phase, direct insertion) 0...290 V

- accuracy class	0.5% f.s ± 2 digit

Current measurement range:

- insertion by means of C.T.	0.05...5.00 A
- accuracy class on range 0.05...5.00 A	0.5% f.s ± 2 digit

Frequency measurement range:

- nominal value	50 / 60 Hz
- range	45...80 Hz
- accuracy class	0.3% vm ± 1 digit
- response time	< 300mS

Apparent Power measurement (S1, S2, S3)

- range	870 KVA
- accuracy class	1% f.s ± 2 digit

Active Energy measurement (Wh)

- import / export kWhmeter	2, different
- resettable	yes
- calculating period	15 minutes
- energy counting	999.999 kWh
- accuracy class with current 0.05...1.0 In	2% fs ± 2 digit

Reactive Energy measurement (varh)

- energy counting	999.999 kVARh
- resettable	yes
- calculating period	15 minutes
- accuracy class with current 0.05...1.0 In	2% fs ± 2 digit

Power Factor measurement

- cosφ range	-1…0…+1

- accuracy class with current 0.1...1.0 In and voltage 0.8...1.2 Un 2% fs ± 2 digit
- cosφ value measured in continuous wave (from 0,00 to 1,00 in all quadrants) permits to display the Active Power in import and export, as consequence inductive and catacitive Reactive Power too.

Phase/phase voltages measurement (medium value) V=(V12+V23+V31)/3

Phase current measurement (medium value) A=(A12+A23+A31)/3

Working time

- Total working time (with presence of voltage)	hh 999.999
- Partial working time (from previous reset)	hh 999.999

Digital filter

- Average (to stabilize the measures)	1…15

Compatible current transformers

- Nominal current	5 A
- Ratio	1...200

Visualization

- display	3 numerical lines LED
- number of characters	9 on three lines
- colour	red

Mechanical characteristics

- mounting	on DIN rail DIN50022
- protection	IP20/ frontal IP30

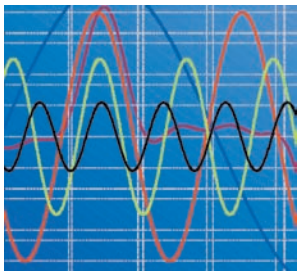
Environment conditions Ambient temperature:

- nominal temperature	0...+45 °C
- range	-5...+55 °C
- storage temperature	-10...+70 °C
- humidity	10...95 %
- atmospheric pressure	70...110 kPa

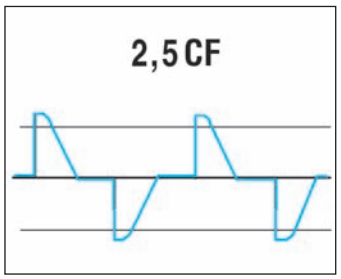
Standards CEI

- Safety CEI EN 61010-1 300V CAT III
- Accuracy class CEI EN 60688
- Electromagnetic compatibility (immunity) CEI EN 61000-6-2
- Electromagnetic compatibility (emission) CEI EN 61000-6-4
- Protection IP CEI EN 60529

MEASUREMENT'S TYPOLOGY



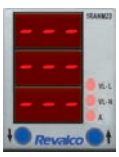
True RMS up to the 20th harmonic wave



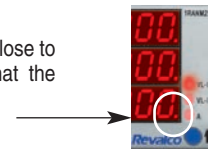
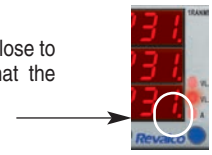
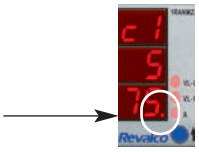
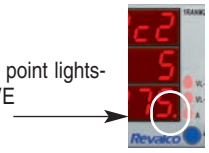
Crest factor up to 2,5 (Voltage and Current)

OPERATION: Instrument furnished already calibrated with the following data: Average = 3; default page = lost voltage; Current transformer = 25/5A; Nominal voltage = 213V (ph-n) and 400V (ph-ph)

- When powered the device makes a self test (all segments of leds light-on for some seconds).
  Changement of pages can be effected "FORWARD" by short pressure of right button, or "BACKWARD" by short pressure of left button.
  Maintaining pressure on buttons you can have: fast forward, reset or configuration of parameters. When one of the button is pressed, the "title" of the page is shown.
- Measurements displaing
  The measurements and signalling pages that appear (pushing and releasing the frontal button) are the following:

PUSHED BUTTON	RELEASED	DESCRIPTION
		This FLASHING signal appears only if: - this page is selected as "default page" (see the correspondent configuration chapter) and the instruments is just light-on or if the auxiliary supply light-off and immediately light-on, or the parameters configuration is finished. After the changement of this page, it disappears from the selection pages.
		On the downer line the value of the voltage in Volt is displayed

medium voltage phase-phase

PUSHED BUTTON	RELEASED	DESCRIPTION
		Measurement of voltage in Volt; the first upper led lights-on If the small points, on the right, light-on (close to each value of the voltage) it means that the sequence of the phases is WRONG. 
phase-phase voltages		
		Measurement of voltage in Volt; the central led lights-on If the small points, on the right, light-on (close to each value of the voltage) it means that the sequence of the phases is WRONG. 
phase-neutral voltages		
		On the downer line the value of asimmetry in Volt is displayed.
phase-phase voltage asimmetry		
		On the downer line the value of current in Ampere is displayed.
medium current		
		Values of current in Ampere. The bottom led lights-on
phase-phase currents		
		On the downer line the value of current in Ampere is displayed.
current on neutral		
		On the downer line the value of frequency in Hz is displayed.
frequency		
		Measurement of Actice Power in Watt. The example shows 5775 W (5,775kW). 
active power - phase 1		
		If on the right side of the value, a little point lights-on it means that the value is NEGATIVE 
active power - phase 2		
active power - phase 3		
		Measurement of Actice Power in Watt. The example shows 17325 W (17,325kW). If on the right side of the value, a little point lights-on it means that the value is NEGATIVE
total active power		

PUSHED BUTTON	RELEASED	DESCRIPTION

power factor - phase 1

Power factor (cosφ). 4 quadrants value, between 0.00 and +/- 1.00.
If the displacement is POSITIVE (inductive) the indications on the display will be <ind> and a point on the right lower side will be lights-off.

power factor - phase 2

If the displacement is NEGATIVE (capacitive) the indications on the display will be <cap> and a point on the right lower side will be lights-on.

When the value is 1.00, the indication conventionally will be <ind>.

power factor - phase 3

total power factor

Power factor (cosφ). 4 quadrants value, between 0.00 and +/- 1.00.
If the displacement is POSITIVE (inductive) the indications on the display will be <ind> and a point on the right lower side will be lights-off.

If the displacement is NEGATIVE (capacitive) the indications on the display will be <cap> and a point on the right lower side will be lights-on.

When the value is 1.00, the indication conventionally will be <ind>.

reactive power - phase 1

Measurement of Reactive Power in Var.
The example shows 954 var (0,954kvar).

reactive power - phase 2

If on the right side of the value, a little point lights-on it means that the value is NEGATIVE, so the measured value is CAPACITIVE instead of INDUCTIVE.

reactive power - phase 3

total reactive power

Measurement of Reactive Power in Var.
The example shows 2862var (2,862kvar).

If on the right side of the value, a little point lights-on it means that the value is NEGATIVE, so the measured value is CAPACITIVE instead of INDUCTIVE.

apparent power - phase 1

Measurement of Apparent Power in VA.
The example shows 5775 VA (5,775kVA).

apparent power - phase 2

apparent power - phase 3

total apparent power

Measurement of Apparent Power in VA.
The example shows 17325 VA (17,325kVA).

PUSHED BUTTON	RELEASED	DESCRIPTION
active energy (import)		Measurement of Energy in kWh. The example shows 12521 KWh. When 999999 is displayed, counting start again from 0. RESET: By a long pressure of right button only, the value flashes, and after few seconds it will be resetted.
active energy (export)		Measurement of Energy in kWh. The example shows 327 KWh. When 999999 is displayed, counting start again from 0. RESET: By a long pressure of right button only, the value flashes, and after few seconds it will be resetted.
reactive energy		Measurement of Energy in kvarh. The example shows 2543 kvarh. When 999999 is displayed, counting start again from 0. RESET: By a long pressure of right button only, the value flashes, and after few seconds it will be resetted.
total hourmeter		Measurements of hours (h). It shows the total working time (from powering of instrument). The example shows 37820 h. When 999999 is displayed, counting start again from 0.
partial hourmeter		Measurements of hours (h). It shows the partial working time (from last reset of instrument). The example shows 249 h. When 999999 is displayed, counting start again from 0. RESET: By a long pressure of right button only, the value flashes, and after few seconds it will be resetted.

PROGRAMMING: Make a long pressure (4 seconds about) on the RIGHT button, while you stay in a page where the resettable parameters are NOT allowed. So not on the pages of Energy or Hour-counter otherwise you obtain the reset of these values without enter on the configuration pages.

The following page appears:

Where in the central line you'll see the device type and release n°. Dot on upper right side of display flashes, three leds light-on meaning the configuration mode. This situation will remain until the end of procedure.

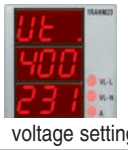
After 4 seconds the pages with configuration parameters start to be displayed; one page every 4 seconds showing the actual selected value.
If it is necessary to see the values without any modification don't touch nothing until the automatic end of the showed pages.

To change the values of parameters, it is enough to press the RIGHT button while this parameter is displayed.

The value change immediately and closed to him a flashing points appear meaning that the value is in modification phase.
To fast forward maintain pressure on the RIGHT button.

The following can be made by pressing the left button:
- pressed during the automatic display of the pages, it increases the time you stay on this page until it is released.
- pressed during the setting of some value (when all the points on the right flashes) decrease step by step this value and it increases the time you stay on this page until it is released.

The modified value is automatically saved in permanent way when the automatic display of the pages starts again.
The following pages can be present or not depending by the model of instruments.

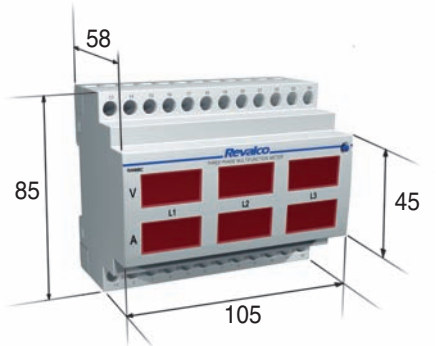
DEFAULT PARAMETER	POSSIBLE VALUES	DESCRIPTION
average	VALUE from 1 to 15	It is the number (n) of single measures effected on the electrical parameter before it's visualization on the display. Practically it is the filter of the measure stabilization. The numbering rise up from 1 to 15; more higher is the selected number, more slow are the eventual variations of reading. This is valid for all the measured parameters.
Default page	ONE OF THE AVAILABLE PAGES	Select the main page that you want to see after the initial powering of the instrument.
CT .../5A	VALUE from 5 to 999 every 5 steps	Select the ratio .../5A of the current transformer.
 voltage setting	VALUE from 200 to 262	It represent the NOMINAL voltage value of end scale value. Phase-phase voltage on the central line. Phase-neutral voltage on the lower line. **The default value (calibrated in factory) is 231V (400V phase-phase).**

THREE PHASE LED MULTIFUNCTION METERS

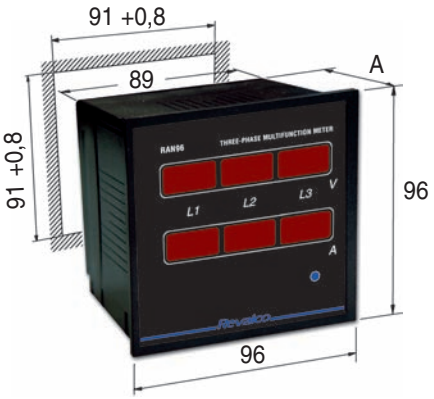
1RANM6....

2RAN96....

DIMENSIONS in mm



The 105 mm dimensions correspond to 6 DIN modules



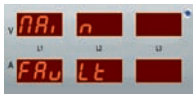
A = 97,3 without terminals cover
A = 116,5 with terminals cover
Weight: 0,55 kg

TECHNICAL CHARACTERISTICS

MODULAR VERSION SWITCHBOARD VERSION	1RANM6 2RAN96	1RANM6R 2RAN96R	1RANM6C 2RAN96C	1RANM6CS 2RAN96CS	1RANM6C485 2RAN96C485	1RANM6CS485 2RAN96CS485	1RANM6C232
ELECTRICAL PARAMETERS							
- Phase-phase Voltage	●	●	●	●	●	●	●
- Phase-neutral Voltage	●	●	●	●	●	●	●
- Current	●	●	●	●	●	●	●
- Total Active Power			●	●	●	●	●
- Total Reactive Power			●	●	●	●	●
- Total Apparent Power			●	●	●	●	●
- Total Active Energy			●	●	●	●	●
- Partial Active Energy			●	●	●	●	●
- Total Reactive Energy			●	●	●	●	●
- Power Factor			●	●	●	●	●
- Frequency			●	●	●	●	●
- Phase sequence			●	●	●	●	●
- Partial and Total working hours			●	●	●	●	●
Possibility to use the output contacts by software (for example: turn-on or turn-off an engine)						●	
The software is available, free of charge, on our internet address www.revalco.it					●	●	●
STANDARD POWER SUPPLY					230 VAC 50/60Hz		
NOMINAL INPUT VALUES							
Voltage					500V		
Primary current					from 5A to 6000A selectable by button located at the front		
Secondary current					5A (1A on request)		
Frequency					from 40 to 60 Hz		
SELECTABLE CAPACITIES					from 5A to 1000A with steps of 5A – from 1000A to 6000A with steps of 50A		
PRECISION CLASS					2% ± 2 digit (Power and Energy) 0,5% ± 2 digit (all other values)		
CONSUMPTION					4VA		
FRONT PROTECTION DEGREE					IP20		
INSULATION CLASS					II		
WORKING TEMPERATURE					-5°C ..... +50°C		
STORAGE TEMPERATURE					-20°C ..... +70°C		
TEST VOLTAGE					2kV at 50Hz for 1 minute		
MEMORY					EEPROM		
TWO OUTPUT REED RELAYS with high power (max 20VA), switching voltage (1000VDC) or peak AC		NA (0,5A-1000V)		NA (0,5A-1000V)		NA (0,5A-1000V)	
SERIAL OUTPUT						RS485	RS232
PROTOCOL						MODBUS SLAVE RTU	MODBUS SLAVE RTU **ASCI on request**
INSULATION VOLTAGE						3kV	
WEIGHT kg					0,50		

1RANM6 - 2RAN96

OPERATION

- Powering the instrument you can see the following page  Main fault

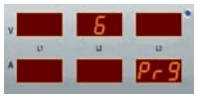
- By pressing the front button, the introduction page of this analyser appears, on which the actual version is also identified.

In this position, the configuration selection menu page will appear (see at the bottom of this page)
To enter into the configuration menu maintain pressure on the front button for a few seconds

- Maintaining pressure on the front button you will see the parameters displayed on this page
  Releasing the button the measurements will be shown
  three voltages phase/phase
  three currents

- Maintaining pressure on the front button you will see the parameters displayed on this page
  Releasing the button the measurements will be shown
  three voltages phase/neutral
  three currents

CONFIGURATION SELECTION MENU

- By pressing the front button for a few seconds a flashing page appears, indicating that you are entering into the configuration selection menu, and you will see for example:
  
  Maintain pressure on the front button untill the following page is displayed. Releasing the button the further pages will be **automatically** shown

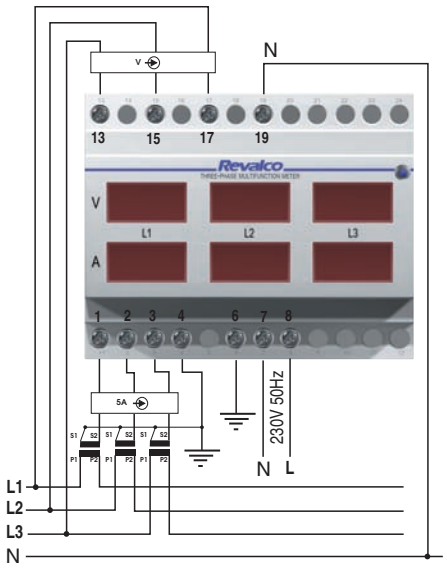
- After a few seconds the CT selection page appears, by pressing the front button you can select the required CT value. From 5A up to 999A with steps of 5A

  From 1000A up to 6000A with steps of 50A for their display it is necessary to refer in kA values where this unit measurement is indicated by the illumination of the light located on the extreme right of the display . To fast forward maintain pressure on the front button
  The example shows the displays of a 1200A CT

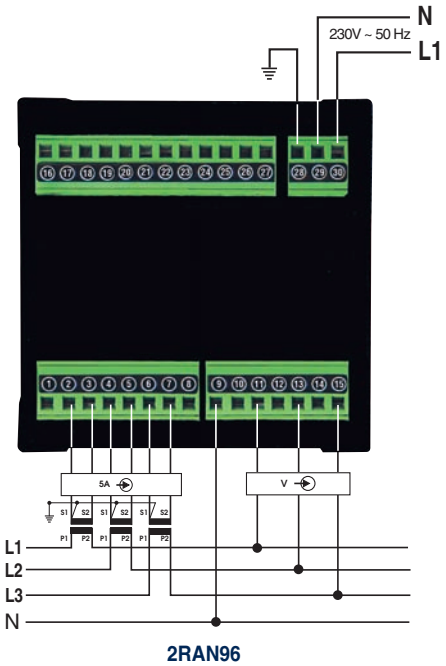
- After a few seconds the page of the mathematical medium n° of samples appears; practically it is the stability filter of the measurement. The numbering goes from 1 to 60; the higher is the selected number the slower is the change of displays.

- Automatically the following page appears: here it is possible to select and memorise the main page that you want to see after the initial energising of the instrument. By pressing in succession the front button, the various titles of the pages available appear and when you see the one required release the button to memorise it.
  After 5 seconds the next page appears.

CONNECTION DIAGRAMS



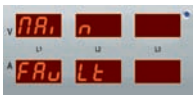
1RANM6



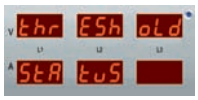
2RAN96

1RANM6R - 2RAN96R

OPERATION

- Powering the instrument you can see the following page  Main fault
- By pressing the front button, the introduction page of this analyser appears, on which the actual version is also identified.

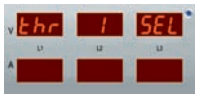
In this position, the configuration selection menu page will appear (see at the bottom of this page)
To enter into the configuration menu maintain pressure on the front button for a few seconds

- Maintaining pressure on the front button you will see the parameters displayed on this page three voltages phase/phase
  Releasing the button the measurements will be shown three currents
- Maintaining pressure on the front button you will see the parameters displayed on this page three voltages phase/neutral
  Releasing the button the measurements will be shown three currents
- Maintaining pressure on the front button you will see the parameters displayed on this page  Showing the actual situation of the thresholds
  Releasing the button ,the activation(ON) or the deactivation(OFF) of the two thresholds (th1 and th2) appears

CONFIGURATION SELECTION MENU

- By pressing the front button for a few seconds a flashing page appears, indicating that you are entering into the configuration selection menu, and you will see for example:
  Maintain pressure on the front button untill the following page is displayed.
  Releasing the button further pages will be **automatically** shown
- After a few seconds the CT selection page appears, by pressing the front button you can select the required CT value. From 5A up to 999A with steps of 5A

  From 1000A up to 6000A with steps of 50A for their display it is necessary to refer in kA values where this unit measurement is indicated by the illumination of the light located on the extreme right of the display . To fast forward maintain pressure on the front button The example shows the displays of a 1200A CT
- After a few seconds the page of the mathematical medium n° of samples appears; practically it is the stability filter of the measurement. The numbering goes from 1 to 60; the higher is the selected number the slower is the change of displays.
- Automatically the following page appears: here it is possible to select and memorise the main page that you want to see after the initial energising of the instrument. By pressing in succession the front button, the various titles of the pages available appear and when you see the one required release the button to memorise it.
  After 5 seconds the next page appears.

  1st alarm threshold configuration page
  When pressing the front button it is possible to choose between: OFF,
  Hi (max alarm),
  Lo (min alarn) 
- On the further page it is possible to select the delay time of the 1st threshold
  When pressing the front button it is possible to choose between: OFF - On (excitation relay delay) or
  On - OFF (disexcitation relay delay)
- On the further page it is possible to select the delay time up to max 30 seconds

- On the further page it is possible to select the parameter to which applies the **1st** alarm threshold between:

3U alarm applied simultaneously to the three phase-neutral voltages, where is enough that one of the three voltages exceeds the selected value to activate the alarm

3UF alarm applied simultaneously to the three phase-phase voltages, where is enough that one of the three voltages exceeds the selected value to activate the alarm

3i alarm applied simultaneously to the three currents, where is enough that one of the three currents exceeds the selected value to activate the alarm

i1 alarm applied to the L1 current phase

i2 alarm applied to the L2 current phase

i3 alarm applied to the L3 current phase

U1 alarm applied to the L1 phase-neutral voltage phase

U2 alarm applied to the L2 phase-neutral voltage phase

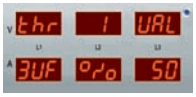
U3 alarm applied to the L3 phase-neutral voltage phase

U12 alarm applied to the L1-L2 voltage phase

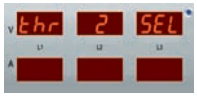
U23 alarm applied to the L2-L3 voltage phase

U31 alarm applied to the L3-L1 voltage phase

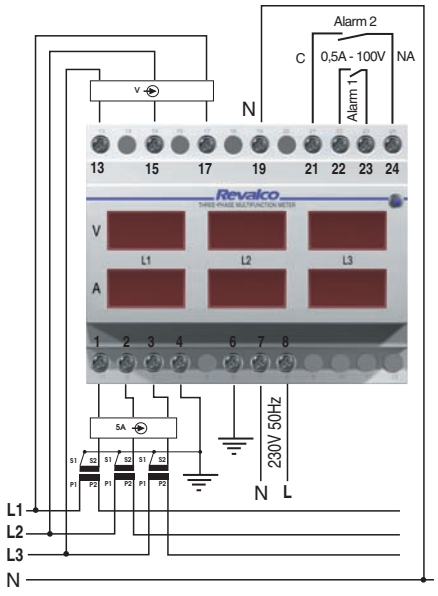
- The further page shows also the percentage value of the alarm.It is possible to modify the percentage value of the alarm; by pressing the front button the percentage is varied with steps of 1%(to fast forward maintain pressure on the front button) and displayed on the page is the equality between the numerical value and the percentage.
Example: having choosen the parameter 3UF, the percentage 51% correspond to 255V



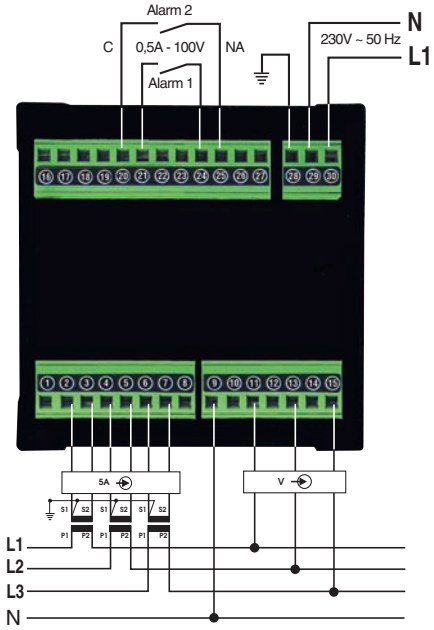
Now the 2nd alarm threshold configuration page appears
Where it is necessary to act exactly as explained above



CONNECTION DIAGRAMS



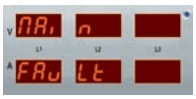
1RANM6R



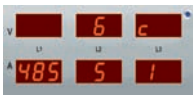
2RAN96R

1RANM6C / 1RANM6C485 / 1RANM6C232
2RAN96C / 2RAN96C485

OPERATION

- Powering the instrument you can see the following page  Main fault

- By pressing the front button, the introduction page of this analyser appears on which the actual version is also identified.

or  or

In this position, the configuration selection menu page will appear (see at the bottom of this page)
To enter into the configuration menu maintain pressure on the front button for a few seconds

- Maintaining pressure on the front button you will see the parameters displayed on this page
  Releasing the button the measurements will be shown

three voltages phase/phase

three currents

- Maintaining pressure on the front button you will see the parameters displayed on this page
  Releasing the button the measurements will be shown

three voltages phase/neutral

three currents

- Maintaining pressure on the front button you will see the parameter displayed on this page
  Releasing the button the measurement will be shown

Total Active Power, expressed in Watt

- Maintaining pressure on the front button you will see the parameter displayed on this page
  Releasing the button the measurement will be shown

Total Reactive Power expressed in Var

- Maintaining pressure on the front button you will see the parameter displayed on this page
  Releasing the button the measurement will be shown

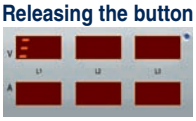
Total Apparent Power, expressed in VA

- Maintaining pressure on the front button you will see the parameter displayed on this page
  Releasing the button the measurement will be shown

Total Active Energy expressed in kWh

- Maintaining pressure on the front button you will see the parameter displayed on this page showing the quantity of energy used in 15 min
  Releasing the button the measurement will be shown

Relative Active Energy, expressed in kWh, memorised every 15 min.



The flashing symbol means that the instrument is counting the used energy during 15 minutes; when the symbol becomes static it means that the 15 minutes are passed and the final value is shown. To zero this value, maintain pressure on the front button.

- Maintaining pressure on the front button you will see the parameter displayed on this page
  Releasing the button the measurement will be shown

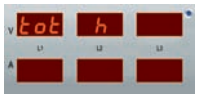
Total Reactive Energy expressed in kVar

- Maintaining pressure on the front button you will see the parameters displayed on this page
  Capacitive (cAP) or Inductive Power Factor (ind) in number (toS), or in electrical degrees (dEG)
  Frequency from 30hz to 70Hz (FrE)
  Releasing the button the measurement will be shown

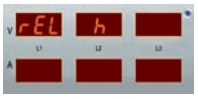
- Maintaining pressure on the front button you will see the parameters displayed on this page

Phase sequence
Releasing the button this indication appears no (not correct sequence)
or YES (correct sequence)

- Maintaining pressure on the front button you will see the parameter displayed on this page
  Hourmeter indicating the working hours of the instrument, the memorising of the time occurs every 15 min
  Releasing the button the measurement will be shown

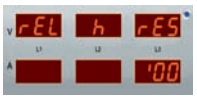


- Maintaining pressure on the front button you will see the parameter displayed on this page
  Releasing the button the measurement will be shown

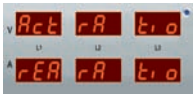


Partial hourmeter indicating the working hours of the instrument

(zeroing in the next page)



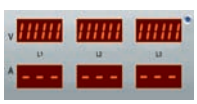
- Maintaining pressure on the front button you will see the parameters displayed on this page:
  Releasing the button the measurement will be shown



Actual analogue bar of the Active Power respect to the Total Apparent Power

Actual analogue bar of the Reactive Power respect to the Total Apparent Power

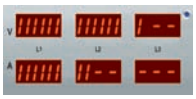
This page serves to give an immediate visual display showing the situation of the installation
Releasing the button you can see for example at cosφ1 the following display:



Active Power

Reactive Power

If the value of the cosphi goes down, the phase displacement angle is immediately displayed, and the Active Power's bar goes down while the Reactive Power's bar will increase as for example in the figure:



Active Power

Reactive Power

- Maintaining pressure on the front button you see the parameter displayed on this page
  Visual simulation of the rotation of the electromechanical active kWh-meter indicating how much energy you are using at that time
  Releasing the button the graphics will be shown

- Maintaining pressure on the front button you see the parameter displayed on this page
  Releasing the button the graphics will be shown

Analogue display bar of the Active Power (settable)

If for example the selected CT is 50/5A but it is well known that the installation is already at 100% with 40A, You'll set the instrument in the way that with 40A the bar shows 100%

CONFIGURATION SELECTION MENU

- By pressing the front button for few seconds a flashing page appears, indicating that you are entering into the configuration selection menu, and you will see for example:

or

or

Maintain pressure on the front button untill the following page is displayed. Releasing the button the further pages will be **automatically** shown

- After a few seconds the CT selection page appears, by pressing the front button you can select the required CT value. From 5A up to 999A with steps of 5A

From 1000A up to 6000A with steps of 50A and for their display it is necessary to refer in kA values where this unit measurement is indicated by the illumination of the light located on the extreme right of the display . To fast forward maintain pressure on the front button
The example shows the displays of a 1200A CT

- After a few seconds the page of the mathematical medium n° of samples appears; practically it is the stability filter of the measurement. The numbering goes from 1 to 60; the higher is the selected number the slower is the change of displays.

- After a few seconds the following page appears, on which it is possible to select the end scale value of the analogue bar of the Active Power (Act Ratio). The indicated example shows a value of 92% that can be modified (with steps of 1%) by pressing the front button(To fast forward maintain pressure on the front button)

Releasing the button the page will show also the numerical equality in Watt of the percentage choosen
In function of the nominal calibration data. If for example the CT 50/5A is selected and the percentage is 92% you'll see:

where 6900W correspond to the end scale (92%)
calculated as follow: 92% = Vnom (230V ph/n (400V ph/ph)) x CT value (50/5A) x 3

230 x 50 = 11500 11.500 : 5 = 2300 2300 x 3 = 6900

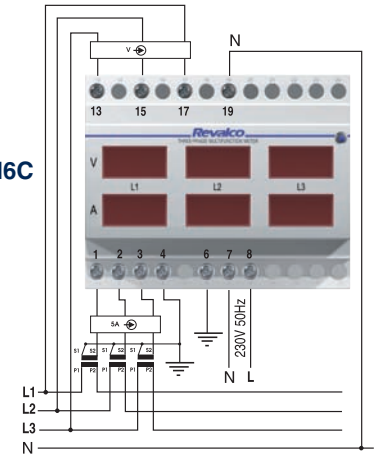
- Automatically the following page appears: here it is possible to select and memorise the main page that you want to see after the initial energising of the instrument. . By pressing in succession the front button, the various titles of the pages available appear and when you see the one required release the button to memorise it.

- After 5 seconds the next page appears(version 1RANM6C485 only) on which, by pressing the front button, it is possible to change the address to assign)

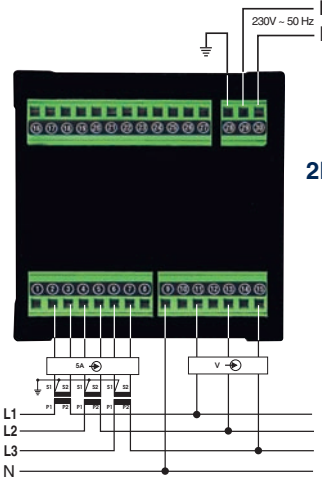
serial address

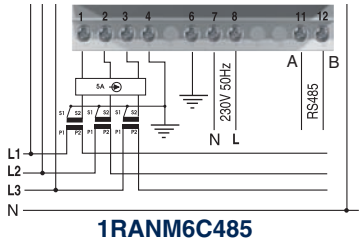
CONNECTION DIAGRAMS - For serial communication, see the proper pages

1RANM6C

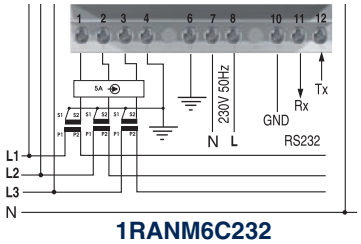


2RAN96C

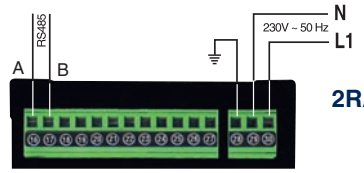




1RANM6C485



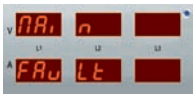
1RANM6C232

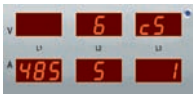


2RAN96C485

1RANM6CS / 1RANM6CS485
2RAN96CS / 2RAN96CS485

OPERATION

- Powering the instrument you can see the following page  Main fault

- By pressing the front button, the introduction page of this analyser appears, on which the actual version is also identified. or 

In this position, the configuration selection menu page will appear (see at the bottom of this page)
To enter into the configuration menu maintain pressure on the front button for a few seconds

- Maintaining pressure on the front button you will see the parameters displayed on this page three voltages phase/phase
three currents
Releasing the button the measurements will be shown

- Maintaining pressure on the front button you will see the parameters displayed on this page three voltages phase/neutral
three currents
Releasing the button the measurements will be shown

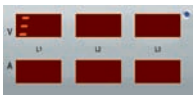
- Maintaining pressure on the front button you will see the parameter displayed on this page Total Active Power, expressed in Watt
Releasing the button the measurement will be shown

- Maintaining pressure on the front button you will see the parameter displayed on this page Total Reactive Power expressed in Var
Releasing the button the measurement will be shown

- Maintaining pressure on the front button you will see the parameter displayed on this page Total Apparent Power, expressed in VA
Releasing the button the measurement will be shown

- Maintaining pressure on the front button you will see the parameter displayed on this page Total Active Energy expressed in kWh
Releasing the button the measurement will be shown

- Maintaining pressure on the front button you will see the parameter displayed on this page showing the quantity of energy used in 15 min Relative Active Energy expressed in kWh memorised every 15 min.
Releasing the button the measurement will be shown

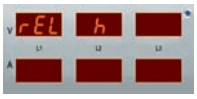

The flashing symbol means that the instrument is counting the used energy during 15 minutes; when the symbol becomes static it means that the 15 minutes are passed and the final value is shown. To zero this value, maintain pressure on the front button.

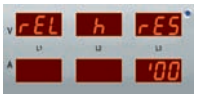
- Maintaining pressure on the front button you will see the parameter displayed on this page Total Reactive Energy expressed in kVar,
Releasing the button the measurement will be shown

- Maintaining pressure on the front button you will see the parameters displayed on this page
Capacitive (CAP) or Inductive Power Factor (ind) in number (CoS), or in electrical degrees (dEG)
Frequency from 30Hz to 70Hz (FrE)
Releasing the button the measurement will be shown

- Maintaining pressure on the front button you will see the parameter displayed on this page Phase sequence
Releasing the button this indication appears : no (not correct sequence)
or YES (correct sequence)

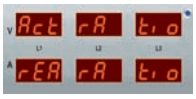
- Maintaining pressure on the front button you will see the parameter displayed on this page
Hourmeter indicating the working hours of the instrument, the memorising of the time occurs every 15 min
Releasing the button the measurement will be shown

- Maintaining pressure on the front button you will see the parameter displayed on this page  Partial hourmeter indicating the working hours of the instrument
Releasing the button the measurement will be shown

(zeroing in the next page) 

- Maintaining pressure on the front button you will see the parameter displayed on this page Actual situation of the thresholds
Releasing the button, the activation (**ON**) or the deactivation (**OFF**) of the two thresholds (th1 and th2) appears showing

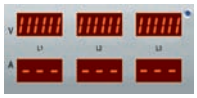
- Maintaining pressure on the front button you see the parameters displayed in this page
  Releasing the button the measurement will be shown



Actual analogue bar of the Active Power respect to the Total Apparent Power

Actual analogue bar of the Reactive Power respect to the Total Apparent Power

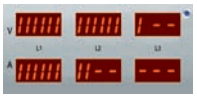
This page serves to give an immediate visual situation of the installation
Releasing the button you can see for example at cosφ1 the following display



Active Power

Reactive Power

If the value of the cosphi goes down, the phase displacement angle is immediately displayed, and the Active Power's bar goes down while the Reactive Power's bar will increase as for example in the figure:



Active Power

Reactive Power

- Maintaining pressure on the front button you see the parameter displayed on this page
  Visual simulation of the rotation of the electromechanical active kWh-meter indicating how much energy you are using at that time
  Releasing the button the graphics will be shown

- Maintaining pressure on the front button you see the parameter displayed on this page
  Releasing the button the graphics will be shown

Analogue display bar of the Active Power (settable)

If for example the selected CT is 50/5A but it is well known that the installation is already at 100% with 40A,
You'll set the instrument in the way that with 40A the bar shows 100%

CONFIGURATION SELECTION MENU

- By pressing the front button for a few seconds a flashing page appears, indicating that you are entering into the configuration selection menu, and you will see for example:

or

Maintain pressure on the front button untill the following page is displayed.
Releasing the button the further pages will be **automatically** shown

- After a few seconds the CT selection page appears, by pressing the front button you can select the required CT value. From 5A up to 999A with steps of 5A

From 1000A up to 6000A with steps of 50A and for their display it is necessary to refer in kA values where this unit measurent is indicated by the illumination of the light located on the extreme right of the display. To fast forward maintain pressure on the front button

The example shows the display of a 1200A CT

- After a few seconds the page of the mathematically medium n° of samples appears; practically it is the stability filter of the measurement. The numbering goes from 1 to 60; the higher is the selected number the slower is the change of displays.

- After a few seconds the following page appears, on which it is possible to select the end scale value of the analogue bar of the Active Power (Act Ratio). The indicated example shows a value of 92% that can be modified (with steps of 1%) by pressing the front button
  (To fast forward maintain pressure on the front button).

Releasing the button the page will show also the numerical equality in Watt of the percentage choosen
In function of the nominal calibration data. If for example the CT 50/5A is selected and the percentage is 92% you'll see:

where 6900W correspond to the end scale (92%)
Calculated as follow: 92% = Vnom (230V ph/n, 400V ph/ph) x CT value 50/5A x 3

230 x 50 = 11500 11.500 : 5 = 2300 2300 x 3 = 6900

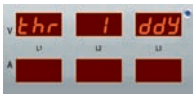
- Automatically the following page appears: here it is possible to select and memorise the main page that you want to see after the initial energising of the instrument. By pressing in succession the front button, the various titles of the pages available appear and when you see the one required release the button to memorise it.

- After 5 seconds the next page appears. (version 1RANM6CS485 only)
  on which , by pressing the front button, it is possible to change the address to assign

serial address

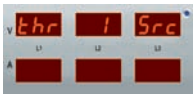
1st alarm threshold configuration page
Where pressing the front button it is possible to choose between: OFF
Hi (max alarm),
Lo (min alarn)

- On the further page it is possible to select the delay time of the 1st threshold
  Where pressing the front button it is possible to choose between: OFF - On (excitation relay delay) or
  On - OFF (disexcitation relay delay)

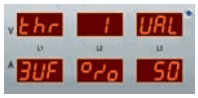


- On the further page it is possible to select the delay time up to max 30 seconds

- On the further page it is possible to select the parameter to which apply the **1st** alarm threshold between:

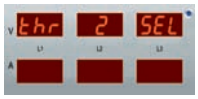


3U alarm applied simultaneously to the three phase-neutral voltages, where is enough that one of the three voltages exceeds the selected value to activate the alarm
3UF alarm applied simultaneously to the three phase-phase voltages, where is enough that one of the three voltages exceeds the selected value to activate the alarm
3i alarm applied simultaneously to the three currents, where is enough that one of the three currents exceeds the selected value to activate the alarm
i1 alarm applied to the L1 current phase
i2 alarm applied to the L2 current phase
i3 alarm applied to the L3 current phase
U1 alarm applied to the L1 phase-neutral voltage phase
U2 alarm applied to the L2 phase-neutral voltage phase
U3 alarm applied to the L3 phase-neutral voltage phase
Act alarm applied to the Active Power
rEA alarm applied to the Reactive Power
APP alarm applied to the Apparent Power
U12 alarm applied to the L1-L2 voltage phase
U23 alarm applied to the L2-L3 voltage phase
U31 alarm applied to the L3-L1 voltage phase
FrE alarm applied to the frequency
deg alarm applied to the electrical degrees of the Power factor
CoS alarm applied to the COSphi of the Power Factor



- The further page shows also the percentage value of the alarm.It is possible to modify the percentage value of the alarm; by pressing the front button the percentage is varied with steps of 1%(to fast forward maintain pressure on the front button) and displayed on the page is the equality between the numerical value and the percentage. Example: having choosen the parameter 3UF, the percentage 51% correspond to 255V

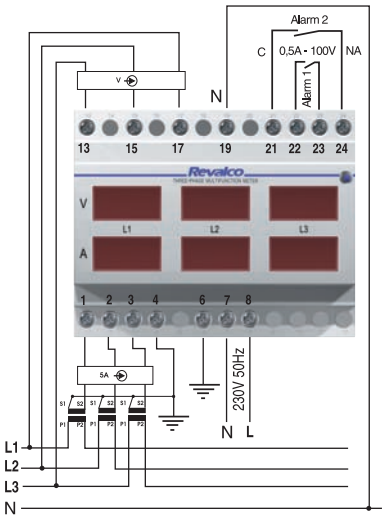
Now the 2nd alarm threshold configuration page appears
Where it is necessary to act exactly as explained before



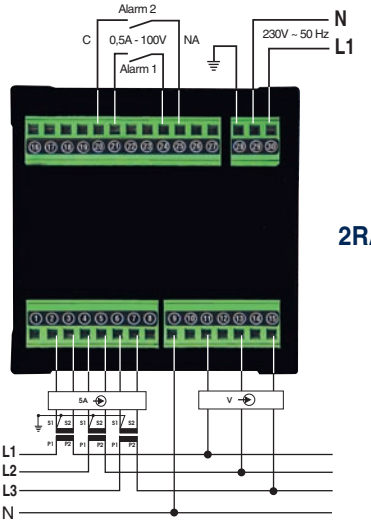
If in the configuration phase you decide NOT to use one or both threshold, these will remain available to be controlled via MODBUS SLAVE RTU, by the controll software.

CONNECTION DIAGRAMS

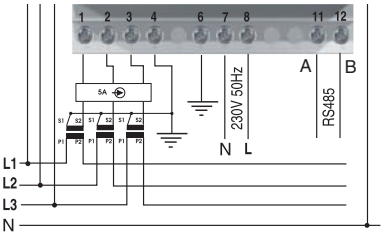
1RANM6CS



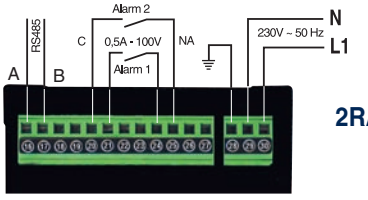
2RAN96CS



1RANM6CS485



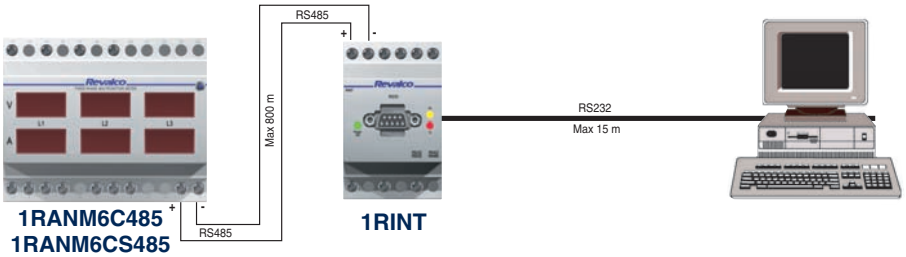
2RAN96CS485



SERIAL COMMUNICATION

Scheme n. 1: Connection between instruments and PC for distances up to 800m

2RAN96C485
2RAN96CS485

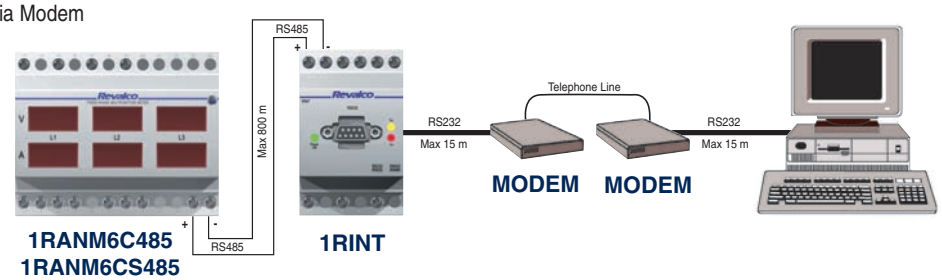


1RANM6C485
1RANM6CS485

1RINT

Scheme n. 2: Connection via Modem

2RAN96C485
2RAN96CS485



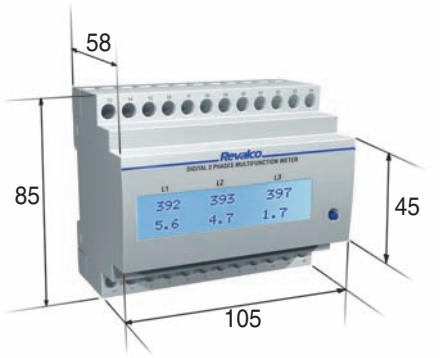
1RANM6C485
1RANM6CS485

1RINT

MODEM **MODEM**

THREE PHASE LCD MULTIFUNCION METERS - TRUE RMS

DIMENSIONS in mm



1RAEM6....
6 DIN modules

GENERAL DESCRIPTION

- Advanced technology of light blue display and blue leds, has visibility and luminosity comparable with the conventional red led display of previous generation.
- All the electrical measurements are represented in their natural form without the use of any multiplicator factor or other artificies for scale change or measuring units.
- Easy and immediate reading without possible incomprehensions or further elaborations.
- The use of one button only permits to change the measurements pages in natural way. The button is lighted to permit the use in darkness ambient also.
- During the program phase, the instrument shows the different possibilities present in the device, so it is not necessary to have in hands the user's manual all the time.
- The first powered page can be selected in the program phase. The "power supply" page can be used in all the cases on which is important **the information of "power supply loss"** (e.g. in refrigerating machines and/or cold storage).
- The possibility to reset the energy and contemporary the hour/minutes value permits, in easy way, to see the relative consumption in a fixed time.
- The possibility to communicate by the rs485 modbus protocol permits to enter , as peripheric bus, into an automation net. **This is one of the " faster" instrument present in the market due the 115200 BAUDE RATE**.
- The software to install on the PC, showed free of charge on the web site, is simple and extremely potent. It permits to visualize, in RS485 MODBUS connection, by a double wire or by BLUETOOH technology, all the measurements showed by the instrument to diagnose with simplicity the status of an electrical net.

By the double possibilities: visualizer and 3-Phase Voltage and Current Oscilloscope

It permits a complete diagnosis of the electrical system showing the wave form without interferences against the normal functions of the instrument(measurement and memorization mode).

In presence of critical situations or not easy diagnoseable phenomena with available numerical data, exixt the possibility to send to the instrument a command of normal activity suspension and enter in the **"quick voltage/current oscilloscope"** mode.

In this mode the isntrument is able to show graphically, in real time, the needed wave form (voltage/current sysncroinized wave of phase L1 or in combination with phases L2 and L3; therefore 6 sinusoidal waves visualized) and see **what actually is happening** on the net.

TECHNICAL CHARACTERISTICS

6 DIN MODULAR VERSION	1RAEM	1RAEMC	1RAEMCS	1RAEMC485	1RAEMCS485	1RAEMBL485
- **PARAMETERS**						
- Ph-N voltage	●	●	●	●	●	●
- Ph-Ph voltage	●	●	●	●	●	●
- Medium voltage of phases	●	●	●	●	●	●
- Current	●	●	●	●	●	●
- Power factor		●	●	●	●	●
- Total equivalent power factor		●	●	●	●	●
- Apparent power		●	●	●	●	●
- Total Apparent power		●	●	●	●	●
- Active power (+/-)		●	●	●	●	●
- Total Active power (+/-)		●	●	●	●	●
- Reactive power		●	●	●	●	●
- Total Reactive power		●	●	●	●	●
- Frequency	●	●	●	●	●	●
- Total Active Energy (import) resettable parameter	●	●	●	●	●	
- Total Active Energy (export) resettable parameter		●	●	●	●	●
- Reactive Total energy resettable parameter		●	●	●	●	●
- Total working time resettable parameter		●	●	●	●	●
- Partial working time parametro azzerabile		●	●	●	●	●
- Sequence of phases		●	●	●	●	●
- Voltage asymmetry (Ph-N)		●	●	●	●	●
- **TWO ALARM OUTPUT RELAYS** (contact N.O. 1000V-0,5A-20VA)			●		●	●
- **PROTOCOL MODBUS SLAVE RTU**						
Baude rate 9600 - 19200 - 38400 - 56800 - 115200				●	●	
- **ACCESS BLUETOOTH POINT (max 10 meters - Class 2)** Baude rate 115200						●
- **The software is available, free of charge, on our internet address www.revalco.it**				●	●	●
- **PERMANENT MEMORY FOR SET POINT AND ENERGIES** (EEPROM)		●	●	●	●	●

TECHNICAL CHARACTERISTICS

Auxiliary power supply

- nominal value U AUX	230	230V, 50/60 Hz
	-P1	22...36VAC and 19...70VDC
	-P2	44..130VAC and 70...240VDC
- range		0.9...1.1 UAUX
- max absorbed power		2 VA

Input voltmeter circuit — Phase-phase voltage:

- direct insertion	max 500 V
- permanent overload	120%
- thermic overload (1 s)	150%
- input impedance of voltmeter circuit	≈ 2 MΩ Ph-N/Phase-Phase

Input ammeter circuit

- nominal current	5 A
- permanent overload	120%
- thermic overload (1 s)	200%
- range adjustment, CT ratio	5...6000

Voltage measurement range

- VLN measurement range (voltage phase, direct insertion)	0...290 V
- accuracy class	0.5% f.s ± 2 digit

Current Measurement range:

- measurement range insertion on CT secondary	0.05...5.00 A
- accuracy class on range 0,05.....5A	0.5% f.s ± 2 digit

Frequency Measurement range:

- nominal value	50/60Hz
- range	45...80 Hz
- accuracy class	0.3% vm ± 1 digit
- response time	< 300mS

Active Power (P1, P2, P3)

- range	85 MW
- accuracy class	1% f.s ± 2 digit

Reactive Power (Q1, Q2, Q3)

- range	85 Mvar
- accuracy class	1% f.s ± 2 digit

Apparent Power (S1, S2, S3)

- range	85 MVA
- accuracy class	1% f.s ± 2 digit

Active Energy (Wh)

- import / export counters resettable	Two separate
- calculating period	15 minutes
- energy counting	4.294.967.295 kWh
- accuracy class with current 0.05...1.0 In	2% fs ± 2 digit

Reactive Energy (varh)

- energy counting resettable	4.294.967.295 kvarh
- calculating period	15 minutes
- accuracy class with current 0.05...1.0 In	2% fs ± 2 digit

Power Factor

- range cosφ	-1...0...+1

- accuracy class with current 0.1...1.0 In and voltage 0.8...1.2 Un 2% fs ± 2 digit

Phase/phase voltages measurement (medium value) V=(V12+V23+V31)/3

Phase current measurement (medium value) A=(A12+A23+A31)/3

Working time

- Total working time	hh:mm (in presence of aux power supply)
- Partial working time	hh:mm (from previous reset)

Digital filter

- Average	1...15

Compatible current transformers

- Nominal current	5 A
- Ratio	1...1200

Visualization

- display	LCD with white leds
- number of characters	18 on two lines
- colour	BLUE

Mechanical characteristics

- mounting	on DIN rail DIN50022/ encased DIN43700
- protection	IP20/ frontal IP30

Electrical characteristics, options — Galvanic insulation

- alarm relay coil-contact	4.25kV
- RS 485	3kV

Relay characteristics

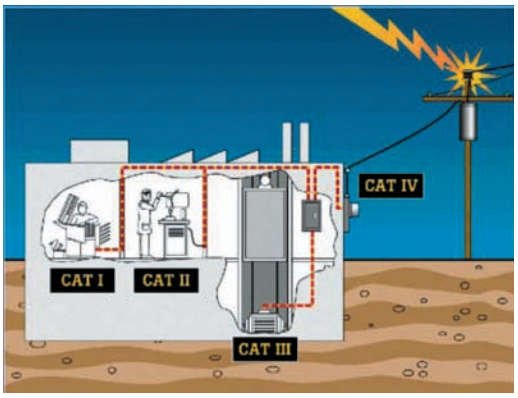
- N.O. contacts maxV....maxI....maxP	1000V 0.5A 20VA

Environment conditions

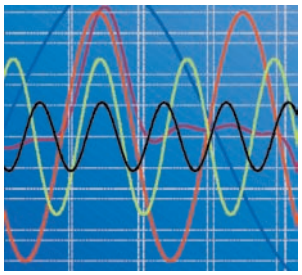
- ambient temperature:	0...+45 °C
- range	-5...+55 °C
- storage temperature	-10...+70 °C
- humidity	10...95 %
- atmospheric pressure	70...110 kPa

Standards CEI

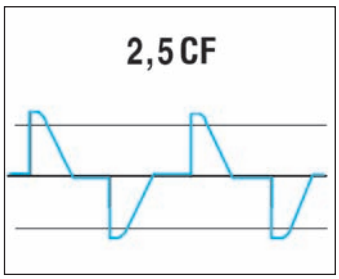
- Safety CEI EN 61010-1 300V CLASS III
- Accuracy class CEI EN 60688
- Electromagnetic compatibility (immunity) CEI EN 61000-6-2 (ex EN 50082-2)
- Electromagnetic compatibility (emission) CEI EN 61000-6-4 (ex EN 50081-2)
- Protection IP CEI EN 60529



MEASUREMENT'S TYPOLOGY:



- True RMS up to the 20th harmonic wave



- Crest factor up to 2,5 (Voltage and Current)

SERIAL INTERFACE

- Two types are forecasted:

1) "485" version: Serial interface RS 485 galvanically insulated (3 kV), suitable for conventional net.
2) "BL" (BLUETOOTH) version: BLUETOOTH interface class 2E. RS 485 interface, galvanically insulated(3 kV). This version permits to execute an access point on net RS485 also, with a fixed speed on demand.
   The standard type has 115.200 bps.
   A115200bps BLUETOOH interface only permits to have the oscilloscope function, and eventually RS485 also if connected with the same speed (115200bps).
   Version "BL" in any case can be connected and used as "485", independently by the bluetooh option present.

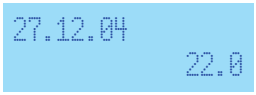
COMMUNICATION DATA

- MODBUS RTU Protocol
- Address from 1 to 255
- Selectable speed on "485" (bps) version: 9600, 19200, 38400, 57600, 115200
- Selectable speed on "BT" (bps) version: standard 115200; on request 9600, 19200, 38400, 57600
- Parity: N; Bits: 8; Stop Bit: 1
- The MODBUS registers table of instrument is available on request or on the web site.

1RAEM

OPERATION

- Powering the instrument you can see the following page



Software date revision and version.
Update

First powering page. A different page can be selected within the available page present on this type.
At first powering the display shows automatically this page

- Introduction page.

-

Program page.Entering in this page and maintaining pressed the button, it is possible to program the parameters of instruments. "Prog" flashes until to enter in program phase. (*)

- Maintaining pressure on the front button you will see the parameters displayed on this page
Releasing the button the measurements will be shown

Medium phase voltage (L1+L2+L3)/3 Frequency
Current I1, I2, I3

- Maintaining pressure on the front button you will see the parameters displayed on this page.
Releasing the button the measurements will be shown

Phase-phase voltage L1-L2, L2-L3, L3-L1
Current I1, I2, I3

- Maintaining pressure on the front button you will see the parameters displayed on this page.
Releasing the button the measurements will be shown

Phase-neutral voltage L1-N, L2-N, L3-N
Current I1, I2, I3

CONFIGURATION SELECTION MENU

- To enter in program phase, see "**OPERATION**" (**red rectangle**)
- The sliding of "programmation parameters" pages is automatic.
To intervene on one or more of these pages it is enough to press the button and start with a serie of short pressure and releases to increase the numbers one by one; to fasr forward maintain pressure on the front button.
Once selected the needed number, release the button and the actual page will advance to the next. At the end of the forecasted pages the instrument will go itself to "measurement visualization" mode and, in case of any modification madde, will save the new values in the permanent memory.

(*)

Program mode page.

- Selection of current transformer ratio.

-

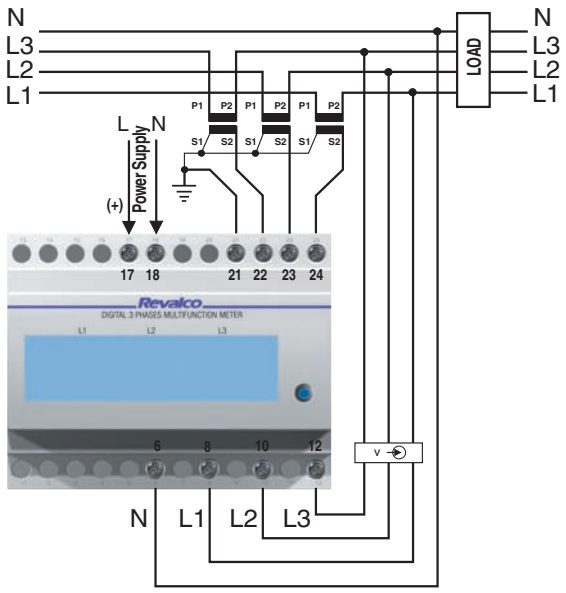
End scale, nominal measurement ph-n. Calibrated in factory. <u>This page is used on models with voltage transformer only.</u>

- Mathematical medium n° of samples, practically it is the stability filter of the measurements. Calibrated in factory. In case of not stabilized measurement, increase the number.

-

Choose of first page at first powering. "Power On Ready" page selected in factory is useful when it is important to know if an electric interruption occoured.

CONNECTION DIAGRAM



1RAEMC / 1RAEMC485

OPERATION

- Powering the instrument you can see the following page

Software date revision and version.

Update

-

First powering page. A different page can be selected within teh available page present on this type.
At first powering the display shows automatically this page

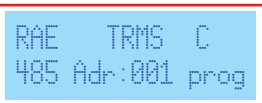
- Introduction page.

or

Correct sequence of phases indication.
Light OFF = correct sequence

-

or



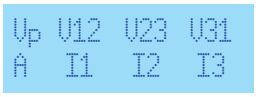
Program page.Entering in this page and maintaining pressed the button, it is possible to program the parameters of instruments. “Prog” flashes until to enter in program phase. (*)

- Maintaining pressure on the front button you will see the parameters displayed on this page
Releasing the button the measurements will be shown

Medium phase voltage (L1+L2+L3)/3 Frequency

Current I1, I2, I3

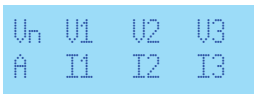
- Maintaining pressure on the front button you will see the parameters displayed on this page.
Releasing the button the measurements will be shown



Phase-phase voltage L1-L2, L2-L3, L3-L1

Current I1, I2, I3

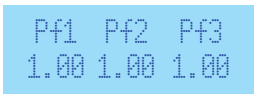
- Maintaining pressure on the front button you will see the parameters displayed on this page.
Releasing the button the measurements will be shown



Phase-neutral voltage L1-N, L2-N, L3-N

Current I1, I2, I3

- Maintaining pressure on the front button you will see the parameters displayed on this page.
Releasing the button the measurements will be shown



Phase Cosφ Ind/Cap Ind/Cap Ind/Cap

L1 L2 L3

- Maintaining pressure on the front button you will see the parameters displayed on these pages.
Releasing the button the measurements will be shown

Active power L1

Active power L2

Active power L3

- Maintaining pressure on the front button you will see the parameters displayed on this page.
Releasing the button the measurements will be shown

Total Active power (L1+L2+L3)

I/C Total Cosφ (I=Ind, C=Cap)

- Maintaining pressure on the front button you will see the parameters displayed on these pages.
Releasing the button the measurements will be shown

Reactive power L1

Reactive power L2

Reactive power L3

- Maintaining pressure on the front button you will see the parameters displayed on this page.
Releasing the button the measurements will be shown

Total Reactive power

- Maintaining pressure on the front button you will see the parameters displayed on these pages.
Releasing the button the measurements will be shown

Apparent power L1

Apparent power L2

Apparent power L3

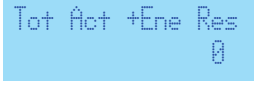
- Maintaining pressure on the front button you will see the parameters displayed on this page.
Releasing the button the measurements will be shown

Total Apparent power

- Maintaining pressure on the front button you will see the parameters displayed on this page.
Releasing the button the measurements will be shown

Total Active Energy (Import)

- Maintaining pressure on the front button you will see the parameters displayed on this page.
Releasing the button the measurements will be shown

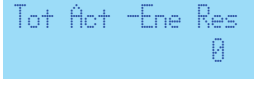


Energy counter reset. Maintaining pressure on button, word “Res” flashes until the end of the reset.

- Maintaining pressure on the front button you will see the parameters displayed on this page.
Releasing the button the measurements will be shown

Total Active Energy (Export)

- Maintaining pressure on the front button you will see the parameters displayed on this page.
Releasing the button the measurements will be shown



Energy counter reset. Maintaining pressure on button, word “Res” flashes until the end of the reset.

- Maintaining pressure on the front button you will see the parameters displayed on this page.
  Releasing the button the measurements will be shown

T.Rea Ene kvarh
0

Total Reactive Energy

- Maintaining pressure on the front button you will see the parameters displayed on this page.
  Releasing the button the measurements will be shown

Tot Rea Ene Res
0

Energy counter reset. Maintaining pressure on button, word “Res” flashes until the end of the reset.

- Maintaining pressure on the front button you will see the parameters displayed on this page.
  Releasing the button the measurements will be shown

Tot Time
0h 21m

Working hours and minutes with powered instrument.

- Maintaining pressure on the front button you will see the parameters displayed on this page.
  Releasing the button the measurements will be shown

Rel Time
1h 52m

Working hours and minutes with powered instrument and from the last reset.Counting time between two resets.

- Maintaining pressure on the front button you will see the parameters displayed on this page.
  Releasing the button the measurements will be shown

Rel Time Res
0 0

Energy counter reset. Maintaining pressure on button, word “Res” flashes until the end of the reset.

- Maintaining pressure on the front button you will see the parameters displayed on this page.
  Releasing the button the measurements will be shown

Asym V
0

Phase asymmetry. Max L1 Phase-neutral voltage value or L2 or L3 less the minimum value of L1 or L2 or L3. The difference determine the voltage lack between the phases.

CONFIGURATION SELECTION MENU

- To enter in program phase, see “**OPERATION**” (**red rectangle**)
- The sliding of “programmation parameters” pages is automatic.
  To intervene on one or more of these pages it is enough to press the button and start with a serie of short pressure and releases to increase the numbers one by one; to fasr forward maintain pressure on the front button.
  Once selected the needed number, release the button and the actual page will advance to the next. At the end of the forecasted pages the instrument will go itself to “measurement visualization” mode and, in case of any modification madde, will save the new values in the permanent memory.

(*)

Program
mode

Program mode page.

- Selection of current transformer ratio.

CT Set
1000

-

VT Set
231

End scale, nominal measurement ph-n. Calibrated in factory. This page is used on models with voltage transformer only.

- Mathematical medium n° of samples, practically it is the stability filter of the measurements. Calibrated in factory. In case of not stabilized measurement, increase the number.

Average
3

-

Default
Page

Choose of first page at first powering. “Power On Ready” page selected in factory is useful when it is important to know if an electric interruption occoured.

- Serial speed 0=9600, 1=19200, 2=38400, 3=57600, 4=115200
  Baude rate = selected speed: N.8.1

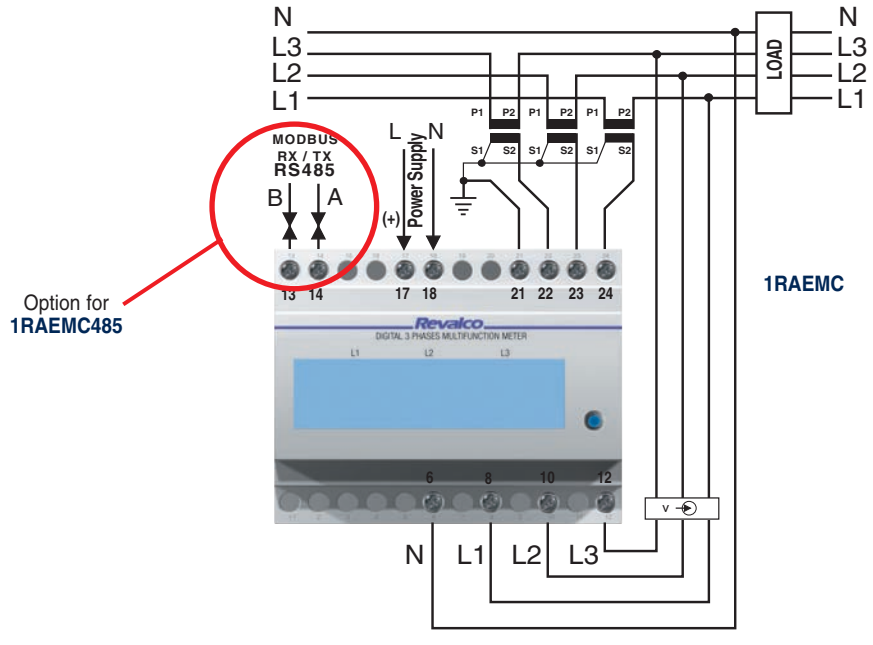
485 Speed
1

-

485 Address
58

MODBUS RTU address (froom 1 to 255)

CONNECTION DIAGRAMS



1RAEMCS
1RAEMCS485 - 1RAEMBL485

OPERATION

- Powering the instrument you can see the following page

Software date revision and version.
Update

-

First powering page. A different page can be selected within teh available page present on this type.
At first powering the display shows automatically this page

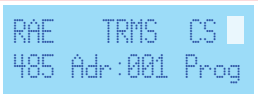
- Introduction page.

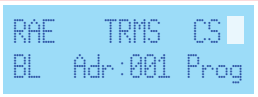
or

or

Correct sequence of phases indication.
Light OFF = correct sequence

-

or 

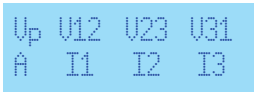
or 

Program page.Entering in this page and maintaining pressed the button, it is possible to program the parameters of instruments. “Prog” flashes until to enter in program phase. (*)

- Maintaining pressure on the front button you will see the parameters displayed on this page
Releasing the button the measurements will be shown

Medium phase voltage (L1+L2+L3)/3 Frequency
Current I1, I2, I3

- Maintaining pressure on the front button you will see the parameters displayed on this page.
Releasing the button the measurements will be shown

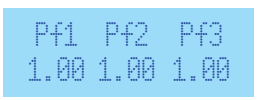


Phase-phase voltage L1-L2, L2-L3, L3-L1
Current I1, I2, I3

- Maintaining pressure on the front button you will see the parameters displayed on this page.
Releasing the button the measurements will be shown

Phase-neutral voltage L1-N, L2-N, L3-N
Current I1, I2, I3

- Maintaining pressure on the front button you will see the parameters displayed on this page.
Releasing the button the measurements will be shown



Phase Cosφ Ind/Cap L1 Ind/Cap L2 Ind/Cap L3

- Maintaining pressure on the front button you will see the parameters displayed on these pages.
Releasing the button the measurements will be shown

Active power L1

Active power L2

Active power L3

- Maintaining pressure on the front button you will see the parameters displayed on this page.
Releasing the button the measurements will be shown

Total Active power (L1+L2+L3)
I/C Total Cosφ (I=Ind, C=Cap)

- Maintaining pressure on the front button you will see the parameters displayed on these pages.
Releasing the button the measurements will be shown

Reactive power L1

Reactive power L2

Reactive power L3

- Maintaining pressure on the front button you will see the parameters displayed on this page.
Releasing the button the measurements will be shown

Total Reactive power

- Maintaining pressure on the front button you will see the parameters displayed on these pages.
Releasing the button the measurements will be shown

Apparent power L1

Apparent power L2

Apparent power L3

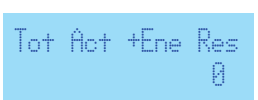
- Maintaining pressure on the front button you will see the parameters displayed on this page.
Releasing the button the measurements will be shown

Total Apparent power

- Maintaining pressure on the front button you will see the parameters displayed on this page.
Releasing the button the measurements will be shown

Total Active Energy (Import)

- Maintaining pressure on the front button you will see the parameters displayed on this page.
Releasing the button the measurements will be shown

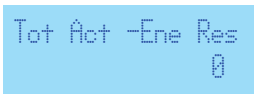


Energy counter reset. Maintaining pressure on button, word “Res” flashes until the end of the reset.

- Maintaining pressure on the front button you will see the parameters displayed on this page.
Releasing the button the measurements will be shown

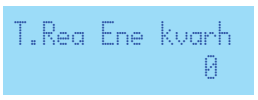
Total Active Energy (Export)

- Maintaining pressure on the front button you will see the parameters displayed on this page.
  Releasing the button the measurements will be shown



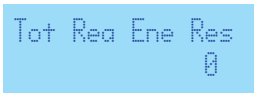
Energy counter reset. Maintaining pressure on button, word “Res” flashes until the end of the reset.

- Maintaining pressure on the front button you will see the parameters displayed on this page.
  Releasing the button the measurements will be shown



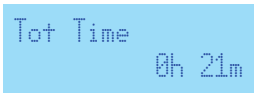
Reattiva Total Reactive Energy

- Maintaining pressure on the front button you will see the parameters displayed on this page.
  Releasing the button the measurements will be shown



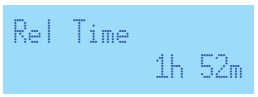
Energy counter reset. Maintaining pressure on button, word “Res” flashes until the end of the reset.

- Maintaining pressure on the front button you will see the parameters displayed on this page.
  Releasing the button the measurements will be shown



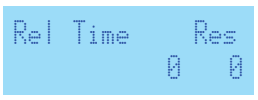
Working hours and minutes with powered instrument.

- Maintaining pressure on the front button you will see the parameters displayed on this page.
  Releasing the button the measurements will be shown



Working hours and minutes with powered instrument and from the last reset.Counting time between two resets.

- Maintaining pressure on the front button you will see the parameters displayed on this page.
  Releasing the button the measurements will be shown



Energy counter reset. Maintaining pressure on button, word “Res” flashes until the end of the reset.

- Maintaining pressure on the front button you will see the parameters displayed on this page.
  Releasing the button the measurements will be shown

Phase asymmetry. Max L1 Phase-neutral voltage value or L2 or L3 less the minimum value of L1 or L2 or L3. The difference determine the voltage lack between the phases.

- Maintaining pressure on the front button you will see the parameters displayed on this page.
  Releasing the button the measurements will be shown

Thresholds status with output relays. “ On” means that the alarm is active and the contact is closed (the relay is normally open)

CONFIGURATION SELECTION MENU

- To enter in program phase, see “**OPERATION**” (**red rectangle**)
- The sliding of “programmation parameters” pages is automatic.
  To intervene on one or more of these pages it is enough to press the button and start with a serie of short pressure and releases to increase the numbers one by one; to fasr forward maintain pressure on the front button.
  Once selected the needed number, release the button and the actual page will advance to the next. At the end of the forecasted pages the instrument will go itself to “measurement visualization” mode and, in case of any modification madde, will save the new values in the permanent memory.

(*)

Program mode page.

- Selection of current transformer ratio.

-

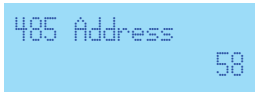
End scale, nominal measurement ph-n. Calibrated in factory. <u>This page is used on models with voltage transformer only.</u>

- Mathematical medium n° of samples, practically it is the stability filter of the measurements. Calibrated in factory. In case of not stabilized measurement, increase the number.

-

Choose of first page at first powering. “Power On Ready” page selected in factory is useful when it is important to know if an electric interruption occoured.

- Serial speed 0=9600, 1=19200, 2=38400, 3=57600, 4=115200
  Baude rate = selected speed: N.8.1

- 

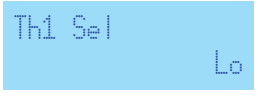
MODBUS RTU address (froom 1 to 255)

- **QUALIFICATION OF RELAY 1** as threshold. If “Off” is selected, this relay can be used by serial way as a peripheric to command another net.

-

Threshold 1 qualified.
Function selection: “Hi” intervention for higher values.
Threshold higher. Lower or equal value is the stand-by condition.

- Threshold 1 qualified.
  Function selection: “Lo” intervention for lower values.
  Threshold lower. Higher or equal value is the stand-by condition.



-

Delay type of threshold 1.
“Off-On” delay to the excitation = delay from hold to work.

- **Delay type of threshold 1.**
  “On-Off” delay to the disexcitation = delay from work to hold.

Th1 Dly
0.2

Delay time of threshold 1.
From 0.0 sec, to 25.0 sec- steps 0.1 sec

Parameters to which the threshold 1 is related.

3Vff = min or max value of 3 phase-phase voltages.
3I = min or max value of currents.
Pim+= min or max value of buyed power (+, import).
Vas = min or max value of voltage asymmetry.
V23 = min or max value of phase-phase voltage L2.
V1 = min or max value of phase-neutral voltage L1.
V3 = min or max value of phase-neutral voltage L3.
I2 = min or max value of current L2.

3Vn = min or max value of 3 phase-neutral voltages.
Fre = min or max value of frequency.
Pex- = min or max value of selled power (-, export).
V12 = min or max value of phase-phase voltage L1.
V31 = min or max value of phase-phase voltage L3.
V2 = min or max value of phase-neutral voltage L2.
I1 = min or max value of current L1.
I3 = min or max value of current L3.

Threshold 1 selected as alarm on buyed power. Selected on the 50% of the nominal value.
Nominal value= (CT value) x (ph-n voltage value) x 3.

Th1 Val 346500.0
PIm+ 50%

QUALIFICATION OF RELAY 2 as threshold. If "Off" is selected, this relay can be used by serial way as a peripheric to command another net.

Th2 Sel
Off

Th2 Sel
Hi

Threshold 2 qualified.
Function selection: "Hi" intervention for higher values.
Threshold higher. Lower or equal value is the stand-by condition.

Threshold 2 qualified.
Function selection: "Lo" intervention for lower values.
Threshold lower. Higher or equal value is the stand-by condition.

Th2 Sel
Lo

Th2 DD
Off-On

Delay type of threshold 2.
"Off-On" delay to the excitation = delay from hold to work.

Delay type of threshold 2.
"On-Off" delay to the disexcitation = delay from work to hold.

Th2 DD
On-Off

Th2 Dly
0.2

Delay time of threshold 2.
From 0.0 sec, to 25.0 sec- steps 0.1 sec

Parameters to which the threshold 2 is related.

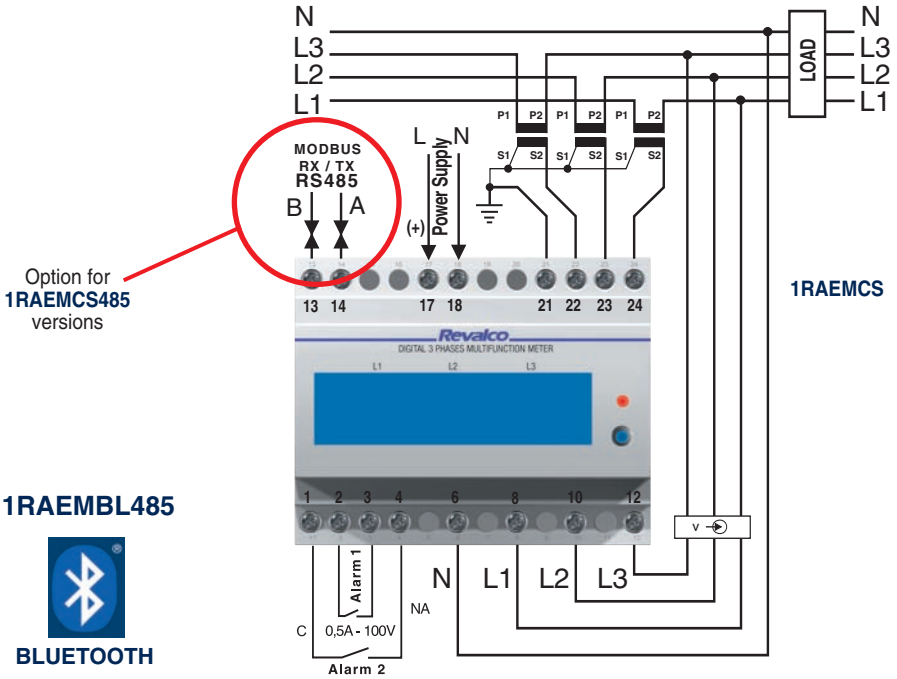
3Vff = min or max value of 3 phase-phase voltages.
3I = min or max value of currents.
Pim+= min or max value of buyed power (+, import).
Vas = min or max value of voltage asymmetry.
V23 = min or max value of phase-phase voltage L2.
V1 = min or max value of phase-neutral voltage L1.
V3 = min or max value of phase-neutral voltage L3.
I2 = min or max value of current L2.

3Vn = min or max value of 3 phase-neutral voltages.
Fre = min or max value of frequency.
Pex- = min or max value of selled power (-, export).
V12 = min or max value of phase-phase voltage L1.
V31 = min or max value of phase-phase voltage L3.
V2 = min or max value of phase-neutral voltage L2.
I1 = min or max value of current L1.
I3 = min or max value of current L3.

Th2 Val 50.0
Fre 50.0

Threshold 2 selected as alarm on frequency. Selected 50 Hz.Value of selected parameter as reference for the correspondent selected alarm value. Being it an absolute value, the selection correspond to the real value.

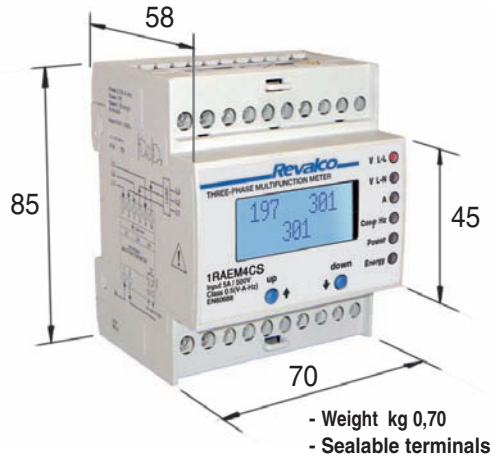
CONNECTION DIAGRAMS



If on 1RAEMBL485 version, RS485 is not connected, it is necessary to mount a 120 Ohm resistance between terminals 13 and 14.

THREE PHASE LCD MULTIFUNCTION METERS - 4 DIN
TRUE RMS - INPUT 5A + option “Split current CT”

DIMENSIONS in mm



- Weight kg 0,70
- Sealable terminals cover included

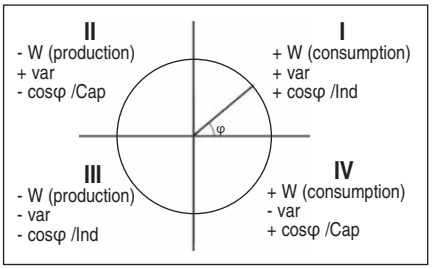
These codes (....-C100) are supplied together with 3 mini split core transformers in class 1 able to measure **up to 100A** and powers up to 70kW three phase. This solution permits a quick installation in already existing panels or nets as that it is not necessary to disconnect the power cable as needed by the classic current transformers. This CT accepts a cable diameter 12mm maximum.

PARAMETERS

	1RAEM4C 1RAEM4C-C100	1RAEM4CS 1RAEM4CS-C100	1RAEM4C485 1RAEM4C485-C100	1RAEM4CS485 1RAEM4CS485-C100
- 3 phase-to-phase voltages, direct or from VT (optional)	●	●	●	●
- 3 phase-to-neutral voltages, direct or from VT (optional)	●	●	●	●
- 3 currents from CT..../5A (1 decimal)	●	●	●	●
- Current in neutral from CT..../5A (1 decimal)	●	●	●	●
- Frequency with 2 decimals	●	●	●	●
- 3 x Active Powers with 4 dialsi			●	●
- Total Active Powers with 4 dials	●	●	●	●
- 3 x Reactive Powers with 4 dials			●	●
- Total Reactive Powers with 4 dials	●	●	●	●
- 3 x Apparent Powers			●	●
- Total Apparent Power	●	●	●	●
- Power Factor of the 3 phases			●	●
- Total Power Factor	●	●	●	●
- Total Active Energy (import) resettable parameter	●	●	●	●
- Total Active Energy (export) resettable parameter	●	●	●	●
- Total Reactive Energy resettable parameter	●	●	●	●
- Total operation counter	●	●	●	●
- Partial operation counter resettable parameter	●	●	●	●
- Programmable threshold with “NO” relay output 500mA/1000V		●		●
- Threshold status summary page		●		●
- Threshold activation signal		●		●
- Indication of the correct voltage phase sequence	●	●	●	●
- Indication of failed voltage supply	●	●	●	●
- RS485 3kV optoinsulated high-speed 5-speed interface			●	●
- **MODBUS RTU SLAVE PROTOCOL** Full compliance			●	●
- Keypad configurable settings	●	●	●	●
- Remote configurable settings			●	●
- Remote resetting of the energies			●	●
- Remote resetting of the partial counter			●	●
- Remote relay output control (if the threshold is OFF)				●
- Configurable password for access to programming	●	●	●	●
- Restore factory settings	●	●	●	●
- Programming of initial page upon start-up	●	●	●	●
- Programming of CT.../5A of 5 to 6000A with step of 5A	●	●	●	●
- Programming of VT (optional) with double indication L-L and L-N	●	●	●	●
- Programming of the analog average (V, A and P)	●	●	●	●
- **Download the software for free from our website www.revalco.it**			●	●

GENERAL DESCRIPTION

The 4 DIN instrument is suited for use in an industrial environment. Simple and extremely compact, it features an alphanumerical display with 2 eight-character lines, 6 auxiliary LEDs and 2 buttons for display selection and keyboard programming. The machine is extremely user-friendly and information is presented clearly on the display. It is unlikely you will need to consult instruction manual which is not generally kept readily available at the site. When properly installed, the instrument can accept full intake flow from external CT 5A to 6A max. Voltage can be direct, max 290Vac Phase/Neutral (=230Vac+25%), or from VT (optional). In this case it is possible to program the full scale value for equivalent voltage at up to 400Vfn (=690Vcc), with guarantee of the displayed values up to 25% more (500Vfn/860Vff).
For direct connection, the Vt must be the same as the rated phase/neutral voltage, normally 231Vac.
There is a “standard” range of measurements for a high precision industrial environment.
The power and power factor data are indicated on 4 dials according to annex E in standard EN61268.
The individually resettable energies (consumed, produced and reactive) can be easily calculated when you need to service the system and/or test line operation, determine zone consumption values, establish cost centres, etc.
NOTE: The instrument uses simple energy totalizing methods for purposes of diagnostics and statistics.
The instrument cannot replace an energy counter. The following are provided according to model:
2 counters (non-resettable total and resettable partial value)
1 threshold with output on “NO” control relay (500mA/1000V), fully programmable.
1 x RS485 3kV optoinsulated programmable high speed interface with MODBUS RTU protocol.
The operating instructions, measurements and technical specifications are given below.



TECHNICAL SPECIFICATIONS

Auxiliary power supply		
- UAUX nominal value	230	230V 50/60 Hz
	-P1	22...36VCA and 19...70VCC
	-P2	44...130VCA and 70....240VCC
- max rated consumption		2 VA
Amp measuring circuits for CT /5		
- Max applicable current (Imax)		6A
- Rated current measurement (Inom)		5A
- Direct current range		0.03...6A
- Input impedance		approx 20mΩ ± 1%
- Permanent overload		110% (Inom)
- Thermal overload (1 s)		200% (Inom)
- Current transformer (Ct) control range (/5)		5…6000A at steps of 5A (0...100A on models ....-C100)
- Precision		0.5%*Imax ± 2 digits
Compatible amp transformers		
- rated current		5 A
- Transformer ratio		1…1200
Voltmeter measuring circuits (instrument for direct insertion)		
- Max applicable voltage (Vmax)		300 Vf n (5 20 Vff)
- Rated voltage measurement (Vnom)		231Vfn(400Vff)
- Direct measuring field		0-300Vfn (520Vff) TRMS up to 20ma arm.
- Input impedance of voltage circuit		approx 2MΩ Phase/Neutral and Phase/Phase
- Vt control range		=Vnom
- Precision		0.5%*Vmax ± 2 digits
Voltmeter measuring circuits (instrument for insertion from VT /100)		
- Maximum applicable voltage (Vmax)		75Vfn(130Vff)
- Rated voltage measurement (Vnom)		57,75 Vfn(100Vff)
- Direct measuring range		0-75Vfn(130Vff) TRMS up to 20ma arm.
- Imput impedance		500KΩ Phase/Neutral and Phase/Phase about
- Control range VT		50…400Vfn(86,5…692Vff)
- Class		0.5%*Vmax ± 2 digit
Compatible voltmeter transformers		
- Rated voltage		100 V
- Transformer ratio		1...6
Frequency measurement		
- Frequency measuring range		9.50...100.00Hz
- Operating range (V1)		35 – 300 Vfn
- Precision		0.1% ± 1 digit
Single power measurement		
- Measurement capacity per line		±2.88 MW /±2.88Mvar /2.88MVA
- Precision (0.05 > Inom > 1.0)		1 % full scale ± 2 digits
Total power measurements		
- Measuring capacity		±8.64 MW /±8.64Mvar /8.64MVA
- Precision (0.05 > Inom > 1.0)		1 % ± 2 digits
Power factor measurement (all)		
- Measuring range cosφ		-1.00…0.00…+1.00
- Precision (0.1 > Inom > 1.0, 0.8 > Vnom >1.2)		2% full scale ± 2 digits
Energy totalizing		
- Counting capacity		99999999kWh /kvarh
- Counting period		15 minutes
- Resettable		YES
- Precision (0.05 > Inom > 1.0)		2% Max
Operating counter		
- Counting capacity		99999:59 hhhhhh:mm
- Counting period		15 minutes
- Resettable		NO
- Precision		2% Max
Partial counter		
- Counting capacity		99999:59 hhhhhh:mm
- Counting period		15 minutes
- Resettable		YES
- Precision		2% Max
Screens		
- Display		Backlit LCD, 8 characters x 2 lines, temp. -20°/+70°
- Auxiliary signals		6 red LEDs

Relay control output (only "S" models)		
- Type of contact	NO	
- Contact specifications	1000Vac / 0.5Aac(res. load) / 20VA max	
- Reel-contact insulation	4.25kVac	
- Remote operation via MODBUS	YES, only for "S485" models	
RS485 serial interface (only "485" models)		
- Insulation	3kV	
- Max communication speed	115.200 bps	
- Communication protocol	MODBUS RTU Full-compliant / JBUS	
- Programmability and remote controls	YES	
Special functions		
- 3-digit password for programming the settings		
- Black-out indicator system		
Terminal specifications		
- Rated current	30A	
- Cable cross-section	22-10AWG 4mm²	
- Torque	0.5Nm (4.5lb.in)	
Mechanical properties		
- Dimensions	Standard 4 DIN modules	
- Type of assembly	DIN50022 guide	
- Degree of protection	for entire device: IP20/ Front IP30	
Environmental conditions		
- Operating temperature:		
Nominal range	0...+45 °C	
Extreme range	-5...+55 °C	
- Storage temperature	-10...+70 °C	
- Relative humidity	10...95 %	
- Atmospheric pressure	70...110 kPa	
Standards of reference		
- Safety	CEI EN 61010-1	300V CAT III
- Precision	CEI EN 60688	(ex EN 50082-2)
- Electromagnetic compatibility (immunity)	CEI EN 61000-6-2	(ex EN 50081-2)
- Electromagnetic compatibility (emission)	CEI EN 61000-6-4	
- Cover protection (IP code)	CEI EN 60529	
Modbus:		
- Protocol specifications	V1.1b, 28.12.2006	

GENERAL OPERATION (FOR ALL MODELS)

The instrument calculates and monitors the electrical measurements of the plant to which it is connected. It displays the information on one of the pages on the display, selected by quickly pressing one of the buttons. The right button is for "next" and the left button is for "previous". The 6 LEDs on the right help to indicate the main electrical measurement pages and switch on according to the type of measurement shown on the display at the time. The first measurement page that appears upon start-up can be programmed.
The "S" models with threshold allow you to configure the measurement to be controlled, the type of threshold (off, maximum or minimum), the millesimal threshold value in relation to the full scale of the controlled measurement, time delay upon activation or deactivation, if applicable, and the time delay in tenths of a second up to 25.5 seconds (0=no delay)
Refer to the "Programming" section for details on programming values and the "Operation of the programmable threshold" section.
The "485" models with RS485 interface can communicate via a network when they are assigned a programmable address of between 1 and 255. You are advised not to put more than 32 devices on a network so as to ensure reliable communication.
If this is not adequate, there are "special" versions able to support more than 64 devices.
Communication speed can be set at between 9600bps and 115,200bps.
You are advised to set the communication speed at maximum if only these devices are used.
If the speed is set too low and there are frequent requests and/or there is a high number of required records, interactions with the instrument may also slow down. All measurements and parameters can be viewed on the MODBUS RTU reader interface.
The instrument also enables "on the fly" remote programming of the work settings via the MODBUS writer interface with the respective records that support it. In certain situations you are also allowed to carry out some macro-operations and controls, such as restoring the factory settings of models that enable this, resetting of the totalizers or direct switching on and off of the output relay for models with threshold. Note: the "485" models offer additional measurements via Modbus, in particular single phase measurements of the powers and cosφ values. Some models feature a blackout indication page.
It is like the measurement page but with flashing content which has to be programmed like the initial page shown on start-up.
When you press the keys to change the measurement page, the "blackout" condition is reset. This is proposed again after any programming of the settings on the keyboard. Some models feature 2 counters – one for total operation and another that can be reset. The latter allows you to check the average consumption if reset together with one or more energy totalizers.
Some models require a 3-digit password (that can be excluded) to change the work settings and reset the counters.
This password is not intended to guarantee full protection but to prevent accidental access to the programming area and ensure the settings are not changed by someone not authorized to do so.
There is no easy way to recover or cancel a password that has been configured and then forgotten. You will have to try all the combinations or return the product to the factory for reprogramming.

NOTES AND OPERATING INSTRUCTIONS

DO NOT PRESS ANY OF THE KEYS while switching on the instrument (i.e. when connecting it to the auxiliary power supply).
Otherwise you may accidentally start the calibration procedure normally carried out at the factory which, if the instrument is connected to the system rather than to the respective calibration devices, could cause the instrument to be permanently uncalibrated. In the interest of safety, **ALWAYS WAIT FOR THE INITIAL DIAGNOSTICS TO FINISH** (scanning of the LEDs) before pressing any of the keys.
"S" instruments with threshold: The threshold relay is blocked for the first ten seconds after the instrument is switched on.
The relay is "frozen" until you have finished configuring the settings.

OPERATION

When you start up the device, the firmware information page appears for a few seconds and all the LEDs switch on in order (initial diagnostics).
You will then see, for a few seconds, the page with the "title" of the measurements that will appear on the display, and the respective LED will switch on if the page requires it to do so. When the first measurement page appears, you can press the buttons to scroll through the available pages.
You can scroll FORWARDS by QUICKLY PRESSING the RIGHT-HAND button, or BACKWARDS by pressing the LEFT-HAND button.
Pressing and holding the right-hand button will take you to the next page as well as allow you to program the instrument's settings.
Pressing one of the 2 buttons quickly displays the "title" of the measurement page to be displayed.

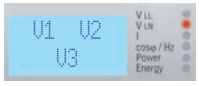
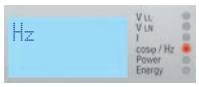
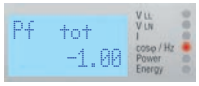
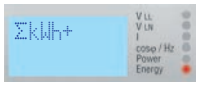
OPERATION

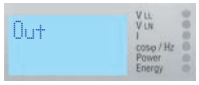
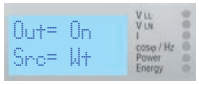
The measurement and indication pages that can be accessed by pressing and QUICKLY releasing the RIGHT-HAND button are as follows:

Appears only for about 3 seconds when the instrument is switched on.
Provides information on the instrument's firmware and operating details.
When this page is displayed, the LEDs flash quickly to indicate they are working properly.

Black-out page
For this to appear, it has to be configured as the default page. Appears only when the instrument is switched on.
It disappears as soon as the display is moved. It reappears after the settings are configured using the keypad.

INFO page. Indicates the instrument model and version. The lit-up square (first line on the right) indicates the voltage phases are OUT OF SEQUENCE. The square does not appear when the sequence is correct. Only in the case of the "485" models does the last value at the bottom on the right indicate the node number of the instrument on the MODBUS network.

PRESSED BUTTON	WHEN RELEASED	DESCRIPTION
Phase-to-phase voltages		Value of each phase-to-phase voltage (V)
 Phase-to-neutral voltages		Value of each phase-to-neutral voltage (V)
Currents of Lines 1 and 2		Value of A1 and A2 (A) The values have decimal points if the selected CT is less than 1000A (/5), otherwise they are whole.
Current of Line 3 / Current in neutral		Value of A3 and Neutral Current (A) The values have decimal points if the selected CT is less than 1000A (/5), otherwise they are whole.
 Frequency		Frequency (Hz) This is measured by V1.
Total active power		Total active power (W) The measurement is POSITIVE for consumed power, NEGATIVE for power produced.
Power factor		Three-phase power factor (Cosφ) The value is the same as the active line power. The offset is void without the indicators "C" (capacitive) or "I" (inductive).
Reactive power		Measurement of Three-phase Reactive Power (var) The measurement is POSITIVE for dials 1 and 2, NEGATIVE for dials 3 and 4.
Three-phase apparent power		Value of Three-phase Apparent Power (VA)
 Totalizing of total active energy consumed		Total Active Energy consumed (kWh)
Totalizing of total active energy produced		Total active energy produced (kWh)
Totalizing of total reactive energy		Total reactive energy (kvarh)
Total counter		The instrument's operating time in hours and minutes (hhhhh:mm)

PRESSED BUTTON	WHEN RELEASED	DESCRIPTION
		Time since last reset in hours and minutes (hhhhh:mm)
Partial counter		
		**ONLY FOR "S" MODELS** Status of output relay contact (On=closed) and source of the threshold
Relay		

OPERATION OF THE PROGRAMMABLE THRESHOLD. The "S" models allow you to apply a max or min threshold as a percentage of the required size, in relation to its intended full scale.

Required size (Th1 Src)	Full scale (= 100.0%)	Description	Required size (Th1 Src)	Full scale (= 100.0%)	Description
W+	CT Set * VT Set * 3	Max/Min instantly consumed active power	V1	VT Set	Max/Min V1
W-	CT Set * VT Set * 3	Max/Min instantly produced active power	V2	VT Set	Max or Min of V2
Hz	100Hz	Max/Min frequency measured on V1	V3	VT Set	Max or Min of V3
3Vf	VT Set * 1,73	Max/Min a phase-to-phase voltage	3A	CT Set	Max or Min of a current
V12	VT Set * 1,73	Max/Min V12	A1	CT Set	Max or Min of A1
V23	VT Set * 1,73	Max/Min V23	A2	CT Set	Max or Min of A2
V31	VT Set * 1,73	Max/Min V31	A3	CT Set	Max or Min of A3
3Vn	VT Set	Max/Min phase-to-neutral voltage	An	CT Set * 3	Max or Min of An

The threshold activation (threshold active) point is the condition "more than Th1 Val" if Th1 Sel = Hi; otherwise "less than Th1 Val" if Th1 Sel = Lo. The threshold's quiescent operating (threshold inactive) point is the condition "less than or equal to Th1 Val" if Th1 Sel=Hi; otherwise "more than or equal to Th1 Val" if Th1 Sel=Lo. The "active threshold" condition attempts to CLOSE the relay's "NO" contacts and this occurs instantly unless there is the delay Th1 Dly if Th1 DD is "Off-On". The "inactive threshold" condition attempts to OPEN the relay's "NO" contacts and this occurs instantly unless there is the delay Th1 Dly if Th1 DD is "On-Off".

There are 2 cases whereby the output relay does NOT mirror the threshold condition. These are as follows:

- During the first 10 seconds from starting up the instrument, when the relay is kept inactive to avoid unwanted operation while the measurements are stabilized, and
- when the settings are being programmed on the keypad, it is kept at the same status at the time of starting the procedure, to prevent partial modification of the settings from causing unwanted change to its status.

Relay status is shown on the display at page "OUT", together with the title of the size of the threshold selected in Th1 Src.
Closing of the relay also determines flashing of the LED associated with the selected size (when applicable), providing the selected measurement page is not the one associated with the LED, in which case the LED light remains steady.

"S485" Models: when Th1 Sel=OFF (threshold OFF), there is the option of controlling the relay directly by means of MODBUS commands to open and close INSTANTLY, regardless of the Th1 Dly and Th1 DD settings. "Src=REM"(REMOTE) appears on the OUT page to indicate remote access of the relay.

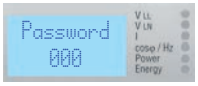
PROGRAMMING

For programming, press and hold the RIGHT-HAND button (for 4 seconds or more). The first page to appear when you are granted access to the programming mode is the one of programmable values. Releasing the button will make the display flash (to indicate you are in programming mode) and the pages begin to scroll through slowly (one every 4 seconds or so), indicating the title and value of the current set-point. If you do not touch the button when you get the last page, normal operation is restored without saving any changes. To make a change, simply press one of the buttons when the required page appears, respectively:

LEFT-HAND button = DECREASES the value; **RIGHT-HAND button** = INCREASES the value.

At that point (after pressing the button) the display remains steady so you can check the modification and the value changes by one unit. If you have to modify a value quite considerably, you can press and hold the button for more than 2 seconds to speed up the process. The longer you hold down the button, the faster you can scroll through the numbers (4 speeds). They are all "roll" values so when you get to the maximum permitted value you restarted from the minimum value, and vice versa. When you have set the value as required, release the button and wait for over 4 seconds. The pages then continue scrolling and the modification is automatically saved. Modifiable pages then follow.

indicates you have entered the setting configuration phase.



A password is only requested if NewPassw is set at a value other than 0 (see below).
Select the correct number and wait for the next page. In the case of a missing or incorrect entry, the instrument returns to normal operation after about 4 seconds.

By pressing a key when this page is shown, all value parameters return equal to the factory programming, except totalizer resetting one by one.

Select the CT value (/5) in Ampères. Between 5 and 6000 in steps of 5.
Default = 100

Select the voltage full-scale value.
If in direct connection, it must be settable between 87 and 692 at steps of 1 V (default = 400) equal to the rated value of the phase-to-neutral line voltage.

During configuration, above is the phase-to-phase value settable between 87 and 692, at steps of 1 V (Default = 400). Below is the phase-to-neutral value settable between 50 and 400 at steps of 1 V (Default = 231)

Average of the analog values measured (V, A and P). To stabilize the displayed values.
The higher the number, more of the measurements are stable – although they will be slow to update.
Settable between 1 and 15 at steps of 1. Default = 3

Configuration of the first measurement page to be viewed upon start-up. Using the buttons to scroll through displays the "titles" of the available pages – the same ones that appear when you press the right-hand button in sequence.
Settable on all the available pages. **Default = Blackout detection page, if available, otherwise the INFO page.**

Setting this at zero disables password protection for programming with the keypad. The same applies for password protection for programming by remote control. Settable between 0 and 999 at steps of 1.
Default = 0 (disabled)

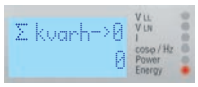
Resetting the Totalizer of the Total Active Energy consumed

Pressing and holding the right-hand button for more than 4 seconds reset the value

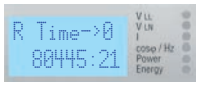
Resetting the Totalizer of the Total Active Energy produced

Pressing and holding the right-hand button for more than 4 seconds reset the value

Resetting the Totalizer of the Total Reactive Energy



Pressing and holding the right-hand button for more than 4 seconds reset the value



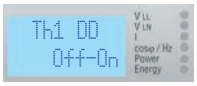
Resetting the Partial counter

Pressing and holding the right-hand button for more than 4 seconds reset the value

THE WINDOWS BELOW APPLY ONLY TO THE "S" MODELS

Selecting the threshold operation mode. Settable between: Hi=High threshold, Lo=Low threshold and Off=threshold disabled. If the threshold is OFF, you will not view the following pages. **Default = Hi (high threshold).**

Delay time for activation of the output relay (page displayed only if Th1 Sel is not Off)
In seconds. Settable between 0.0 and 25.5 in steps of 0.1. **Default = 0.1**



Assigning the delay time for activating the threshold (page displayed only if Th1 Sel is not Off)
The delay time is applicable from the start of threshold activation (Off-On) or at the end (On-Off). **Default = Off-On (at the start)**

Assigning the size for activating the threshold (page displayed only if Th1 Sel is not Off)
Settable at: W+, W-, Hz, 3Vf, V12, V23, V31, 3Vn, V1, V2, V3, 3A, A1, A2, A3,An. **Default = W+**

Regulating the threshold value as a percentage of the full scale (page displayed only if Th1 Sel is not Off)

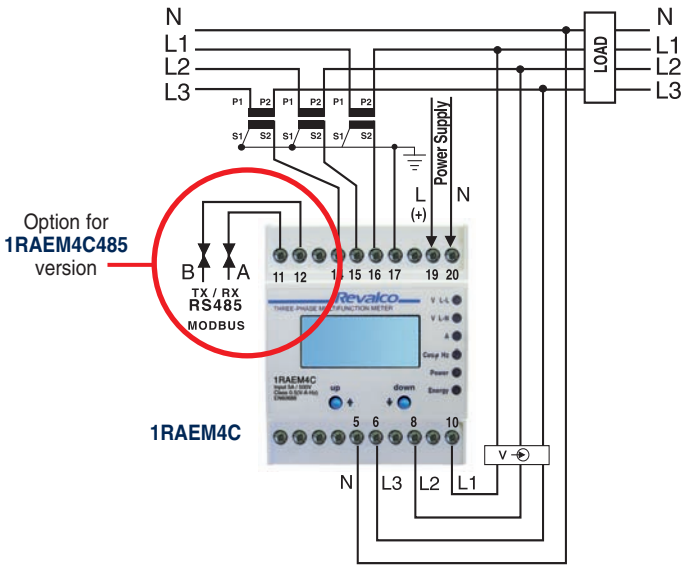
At the top is the effective value of the threshold for the selected size. Settable between: 0.0 and 100.0, in steps of 0.1.
Default = 50.0(%)

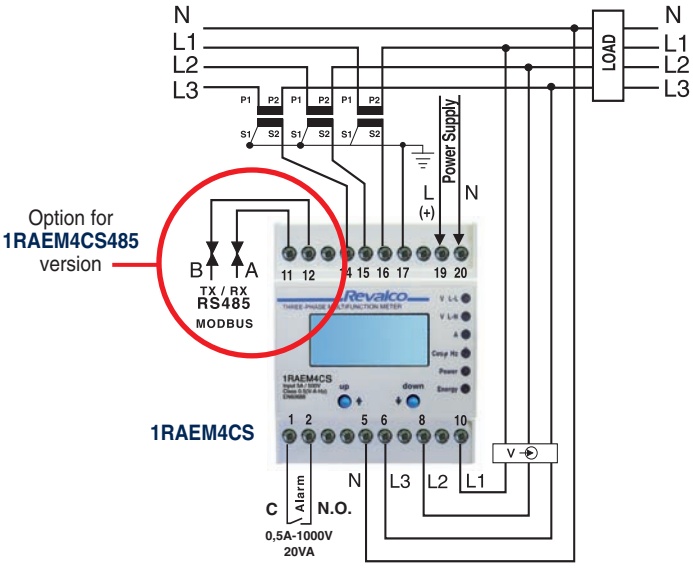
THE WINDOWS BELOW APPLY ONLY TO THE "485" MODELS

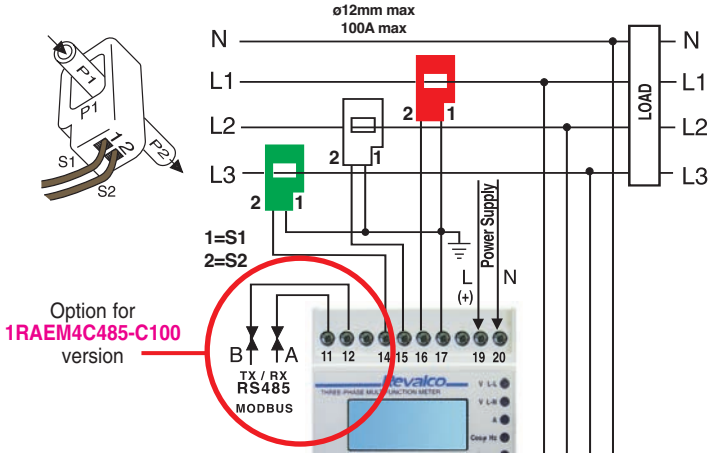
Assigning the MODBUS address node number (of the "INFO" page). Settable between 1 and 255. **Default = 1**

Configuring the speed of the RS485 serial port (bps).
Settable between 0 and 4 **Default = 4**
(0=9600, 1=19200, 2=38400, 3=57600, 4=115200)

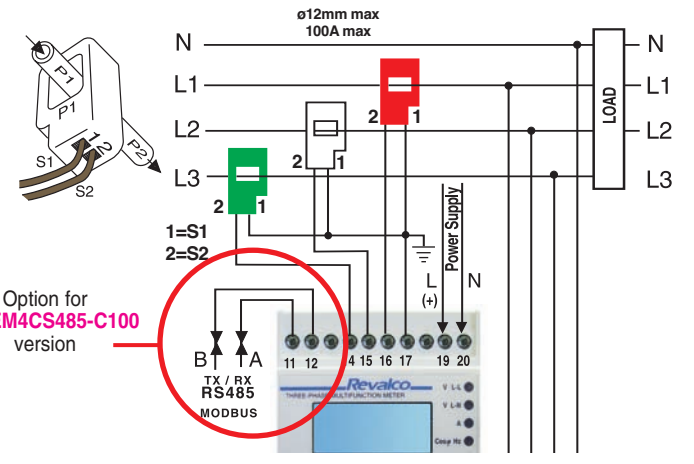
CONNECTION DIAGRAMS







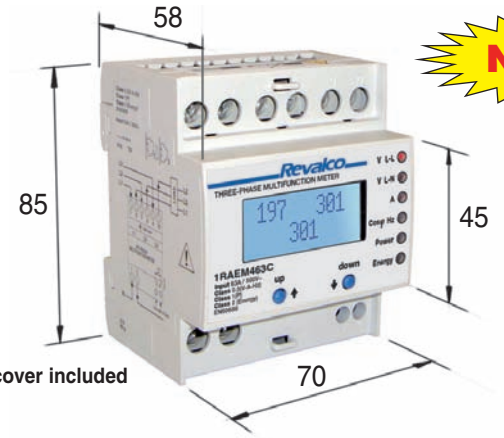
1RAEM4C-C100



1RAEM4CS-C100

THREE PHASE LCD MULTIFUNCTION METERS - 4 DIN
TRUE RMS - DIRECT INPUT 10A, 16A, 32A, 63A

DIMENSIONS in mm



NEW

- Weight kg 0,70
- Sealable terminals cover included

GENERAL DESCRIPTION

These instruments are compatible with the correspondent currents of magneto-thermic switches present on the distribution boards and requested by the market.

The 4 DIN instrument is suited for use in an industrial and civil market. Simple and extremely compact, it features an alphanumerical display with 2 eight-character lines, 6 auxiliary LEDs and 2 buttons for display selection and key-board programming. The machine is extremely user-friendly and information is presented clearly on the display. It is unlikely you will need to consult instruction manual which is not generally kept readily available at the site. The instruments are self-supplied; they keep the auxiliary supply from the same connections used for the measure. The current measure is direct and it is not necessary to use external transformers.

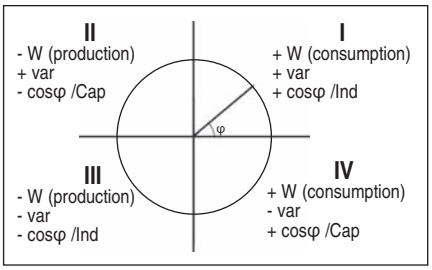
There is a “standard” range of measurements for a high precision industrial environment.

The power and power factor data are indicated on 4 dials according to annex E in standard EN61268.

The individually resettable energies (consumed, produced and reactive) can be easily calculated when you need to service the system and/or test line operation, determine zone consumption values, establish cost centres, etc.

NOTE: The instrument uses simple energy totalizing methods for purposes of diagnostics and statistics.

The instrument cannot replace an energy counter. The following are provided according to model: 2 counters (non-resettable total and resettable partial value); 1 threshold with output on “NO” control relay (500mA/1000V), fully programmable (for model ...CS); 1 x RS485 3kV optoinsulated programmable high speed interface with MODBUS RTU protocol (for model ...C485). The operating instructions, measurements and technical specifications are given below.



PARAMETERS

	- direct insertion **63A**	- direct insertion **32A**	- direct insertion **16A**	- direct insertion **10A**
	1RAEM463C	**1RAEM432C**	**1RAEM416C**	**1RAEM410C**
	1RAEM463CS	**1RAEM432CS**	**1RAEM416CS**	**1RAEM410CS**
	1RAEM463C485	**1RAEM432C485**	**1RAEM416C485**	**1RAEM410C485**
- 3x voltages Phase-phase	●	●	●	
- Medium voltage three-phase	●	●	●	
- Voltage asimmetry	●	●	●	
- 3 phase-to-neutral voltages	●	●	●	
- 3x currents, 2 decimals	●	●	●	
- Medium current, 2 decimals	●	●	●	
- Current in neutral, 2 decimals	●	●	●	
- Frequency with 2 decimals	●	●	●	
- 3 x Active Powers, 4 dials	●	●	●	
- Total Active Powers, 4 dials	●	●	●	
- 3 x Reactive Powers, 4 dials	●	●	●	
- Total Reactive Powers, 4 dials	●	●	●	
- 3 x Apparent Powers	●	●	●	
- Total Apparent Power	●	●	●	
- Power Factor of the 3 phases, 4 dials	●	●	●	
- Total Power Factor, 4 dials	●	●	●	
- Total Active Energy (import) resettable parameter	●	●	●	
- Total Active Energy (export) resettable parameter	●	●	●	
- Total Reactive Energy resettable parameter	●	●	●	
- Total operation counter	●	●	●	
- Partial operation counter resettable parameter	●	●	●	
- Programmable threshold with “NO” relay output 500mA/1000V		●		
- Threshold status summary page		●		
- Threshold activation signal		●		
- RS485 3kV optoinsulated high-speed 5-speed interface			●	
- **MODBUS RTU SLAVE PROTOCOL** Full compliance			●	
- Remote configurable settings			●	
- Remote resetting of the energies			●	
- Remote resetting of the partial counter			●	
- Indication of the correct voltage phase sequence	●	●	●	
- Indication of failed voltage supply	●	●	●	
- Keypad configurable settings	●	●	●	
- Configurable password for access to programming	●	●	●	
- Restore factory settings	●	●	●	
- Programming of initial page upon start-up	●	●	●	
- Programming of the analog average (V, A and P)	●	●	●	
- **Download the software for free from our website www.revalco.it**	●	●	●	

TECHNICAL SPECIFICATIONS

Auxiliary power supply		
- UAUX nominal value	230	230V 50/60 Hz
	-P1	22...36VCA and 19...70VCC
	-P2	44...130VCA and 70....240VCC
- max rated consumption		2 VA
Voltmeter measuring circuits (instrument for direct insertion)		
- Max applicable voltage (Vmax)		300 Vf n (5 20 Vff)
- Rated voltage measurement (Vnom)		231Vfn(400Vff)
- Direct measuring field		0-300Vfn (520Vff) TRMS up to 20ma arm.
- Input impedance of voltage circuit		approx 2MΩ Phase/Neutral and Phase/Phase
- Precision		0.5%*Vmax ± 2 digits
Current direct measuring circuits (1RAEM463... and 1RAEM432...)		
- Max applicable current (Imax)		70A
- Rated current measurement (Inom)		63A (32A)
- Direct current range		0.20...70.00A (0.20…35.00A)
- Resolution		200mA
- Permanent overload		110% (Inom)
- Thermal overload (1 s)		200% (Inom)
- Precision		0.5%*Imax ± 2 digits
Current direct measuring circuits (1RAEM416... and 1RAEM410...)		
- Max applicable current (Imax)		21A
- Rated current measurement (Inom)		16A (10A)
- Direct current range		0.10...21.00A (0.10…11.00)
- Resolution		100mA
- Permanent overload		110% (Inom)
- Thermal overload (1 s)		200% (Inom)
- Precision		0.5%*Imax ± 0,1A
Frequency measurement		
- Frequency measuring range		9.50...100.00Hz
- Operating range (V1)		35 – 300 Vfn
- Precision		0.1% ± 1 digit
Single power measurement		
- Measurement capacity per line		±18 kW /±18 kvar / 18kVA
- Precision (0.05 > Inom > 1.0)		1 % full scale ± 2 digits
Total power measurements		
- Measuring capacity		±55 kW /±55 kvar / 55kVA
- Precision (0.05 > Inom > 1.0)		1 % ± 2 digits
Power factor measurement (all)		
- Measuring range cosφ		-1.00…0.00…+1.00
- Precision (0.1 > Inom > 1.0, 0.8 > Vnom >1.2)		2% full scale ± 2 digits
Energy totalizing		
- Counting capacity		99999999kWh /kvarh
- Counting period		15 minutes
- Resettable		YES
- Precision (0.05 > Inom > 1.0)		2% Max
Operating counter		
- Counting capacity		99999:59 hhhhhh:mm
- Counting period		15 minutes
- Resettable		NO
- Precision		2% Max
Partial counter		
- Counting capacity		99999:59 hhhhhh:mm
- Counting period		15 minutes
- Resettable		YES
- Precision		2% Max
Screens		
- Display		Backlit LCD, 8 characters x 2 lines, temp. -20°/+70°
- Auxiliary signals		6 red LEDs
Relay control output (only "S" models)		
- Type of contact		NO
- Contact specifications		1000Vac / 0.5Aac(res. load) / 20VA max
- Reel-contact insulation		4.25kVac
RS485 serial interface (only "485" models)		
- Insulation		3kV
- Max communication speed		115.200 bps
- Communication protocol		MODBUS RTU Full-compliant / JBUS
- Programmability and remote controls		YES
Special functions		
- 3-digit password for programming the settings		
- Black-out indicator system		
Terminal specifications		
- Rated Current		70A
- Wire range		2,5mm² - 16mm²
- Torque min. / max		1.2Nm / 1.5Nm
- Strip lenght		12mm
Mechanical properties		
- Dimensions		Standard 4 DIN modules
- Type of assembly		DIN50022 guide
- Degree of protection		for entire device: IP20/ Front IP30
Environmental conditions		
- Operating temperature: Nominal / Extreme range		0...+45 °C / -5...+55 °C
- Storage temperature		-10...+70 °C
- Relative humidity / Atmospheric pressure		10...95 % / 70...110 kPa

Standards of reference

- Safety	CEI EN 61010-1	300V CAT III
- Precision	CEI EN 60688	(ex EN 50082-2)
- Electromagnetic compatibility (immunity)	CEI EN 61000-6-2	(ex EN 50081-2)
- Electromagnetic compatibility (emission)	CEI EN 61000-6-4	
- Cover protection (IP code)	CEI EN 60529	
Modbus:		
- Protocol specifications	V1.1b, 28.12.2006	

GENERAL OPERATION (FOR ALL MODELS)

The instrument calculates and monitors the electrical measurements of the plant to which it is connected. It displays the information on one of the pages on the display, selected by quickly pressing one of the buttons. The right button is for “next” and the left button is for “previous”. The 6 LEDs on the right help to indicate the main electrical measurement pages and switch on according to the type of measurement shown on the display at the time. The first measurement page that appears upon start-up can be programmed.
The “S” models with threshold allow you to configure the measurement to be controlled, the type of threshold (off, maximum or minimum), the millesimal threshold value in relation to the full scale of the controlled measurement, time delay upon activation or deactivation, if applicable, and the time delay in tenths of a second up to 25.5 seconds (0=no delay)
Refer to the “Programming” section for details on programming values and the “Operation of the programmable threshold” section.
The “485” models with RS485 interface can communicate via a network when they are assigned a programmable address of between 1 and 255. You are advised not to put more than 32 devices on a network so as to ensure reliable communication.
If this is not adequate, there are “special” versions able to support more than 64 devices.
Communication speed can be set at between 9600bps and 115,200bps.
You are advised to set the communication speed at maximum if only these devices are used.
If the speed is set too low and there are frequent requests and/or there is a high number of required records, interactions with the instrument may also slow down. All measurements and parameters can be viewed on the MODBUS RTU reader interface.
The instrument also enables “on the fly” remote programming of the work settings via the MODBUS writer interface with the respective records that support it. In certain situations you are also allowed to carry out some macro-operations and controls, such as restoring the factory settings of models that enable this, resetting of the totalizers. Some models feature a blackout indication page.
It is like the measurement page but with flashing content which has to be programmed like the initial page shown on start-up.
When you press the keys to change the measurement page, the “blackout” condition is reset. This is proposed again after any programming of the settings on the keyboard. Some models feature 2 counters – one for total operation and another that can be reset. The latter allows you to check the average consumption if reset together with one or more energy totalizers.
Some models require a 3-digit password (that can be excluded) to change the work settings and reset the counters.
This password is not intended to guarantee full protection but to prevent accidental access to the programming area and ensure the settings are not changed by someone not authorized to do so.
There is no easy way to recover or cancel a password that has been configured and then forgotten. You will have to try all the combinations or return the product to the factory for reprogramming.

NOTES AND OPERATING INSTRUCTIONS

DO NOT PRESS ANY OF THE KEYS while switching on the instrument (i.e. when connecting it to the auxiliary power supply).
Otherwise you may accidentally start the calibration procedure normally carried out at the factory which, if the instrument is connected to the system rather than to the respective calibration devices, could cause the instrument to be permanently uncalibrated. In the interest of safety, **ALWAYS WAIT FOR THE INITIAL DIAGNOSTICS TO FINISH** (scanning of the LEDs) before pressing any of the keys.
“S” instruments with threshold: The threshold relay is blocked for the first ten seconds after the instrument is switched on.
The relay is “frozen” until you have finished configuring the settings.

OPERATION

When you start up the device, the firmware information page appears for a few seconds and all the LEDs switch on in order (initial diagnostics).
You will then see, for a few seconds, the page with the “title” of the measurements that will appear on the display, and the respective LED will switch on if the page requires it to do so. When the first measurement page appears, you can press the buttons to scroll through the available pages.
You can scroll FORWARDS by QUICKLY PRESSING the RIGHT-HAND button, or BACKWARDS by pressing the LEFT-HAND button.
Pressing and holding the right-hand button will take you to the next page as well as allow you to program the instrument’s settings.
Pressing one of the 2 buttons quickly displays the “title” of the measurement page to be displayed.

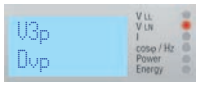
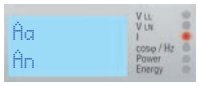
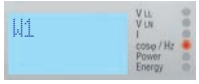
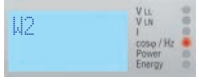
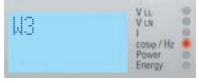
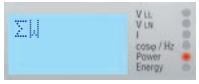
OPERATION

The measurement and indication pages that can be accessed by pressing and QUICKLY releasing the RIGHT-HAND button are as follows:

Appears only for about 3 seconds when the instrument is switched on.
Provides information on the instrument's firmware and operating details.
When this page is displayed, the LEDs flash quickly to indicate they are working properly.

Black-out page
For this to appear, it has to be configured as the default page. Appears only when the instrument is switched on.
It disappears as soon as the display is moved. It reappears after the settings are configured using the keypad.

INFO page. Indicates the instrument model and version. The lit-up square (first line on the right) indicates the voltage phases are OUT OF SEQUENCE. The square does not appear when the sequence is correct. Only in the case of the "485" models does the last value at the bottom on the right indicate the node number of the instrument on the MODBUS network.

PRESSED BUTTON	WHEN RELEASED	DESCRIPTION
Phase-to-phase voltages		Value of each phase-to-phase voltage (V)
 3 phase medium voltage and phase-phase voltage asimmetry		Phase-phase voltage (V)
Phase-to-neutral voltages		Value of each phase-to-neutral voltage (V)
Current of Line 1		Value of A1 (A) The value has 2 decimals
Current of Line 2		Value of A2 (A) The value has 2 decimals
Current of Line 3		Value of A3 (A) The value has 2 decimals
 3 phase medium Current and current on neutral		Value of medium Current and current on neutral (A) The values have 2 decimals
Frequency		Frequency (Hz) This is measured by V1.
 Active power of line 1		Active power of line 1 (W) The measurement is POSITIVE for consumed power, NEGATIVE for produced power.
 Active power of line 2		Active power of line 2 (W) The measurement is POSITIVE for consumed power, NEGATIVE for produced power.
 Active power of line 3		Active power of line 3 (W) The measurement is POSITIVE for consumed power, NEGATIVE for produced power.
 Total active power		Total active power (W) The measurement is POSITIVE for consumed power, NEGATIVE for produced power.

Power factor of Line 1

Value of Pf1 (A)
The mark is the same of the line active power. Without the indicators “C” or “I” the deplacement is null.
If some lines appear, the value is not possible to measure.

Power factor of Line 2

Value of Pf2 (A)
The mark is the same of the line active power. Without the indicators “C” or “I” the deplacement is null.
If some lines appear, the value is not possible to measure.

Power factor of Line 3

Value of Pf3 (A)
The mark is the same of the line active power. Without the indicators “C” or “I” the deplacement is null.
If some lines appear, the value is not possible to measure.

Power factor

Three-phase power factor (Cosφ)
The mark is the same of the line active power. Without the indicators “C” or “I” the deplacement is null.
If some lines appear, the value is not possible to measure.

Reactive power of Line 1

Reactive power of Line 1 (var)
The measurement is POSITIVE for dials 1 and 2, NEGATIVE for dials 3 and 4.

Reactive power of Line 2

Reactive power of Line 2 (var)
The measurement is POSITIVE for dials 1 and 2, NEGATIVE for dials 3 and 4.

Reactive power of Line 3

Reactive power of Line 3 (var)
The measurement is POSITIVE for dials 1 and 2, NEGATIVE for dials 3 and 4.

Reactive power

Measurement of Three-phase Reactive Power (var)
The measurement is POSITIVE for dials 1 and 2, NEGATIVE for dials 3 and 4.

Apparent power of Line 1

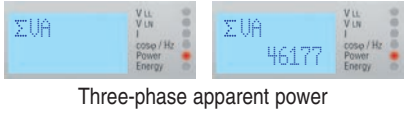
Value of Apparent power of Line 1 (VA)

Apparent power of Line 2

Value of Apparent power of Line 2 (VA)

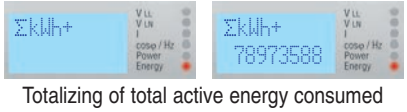
Apparent power of Line 3

Value of Apparent power of Line 3 (VA)



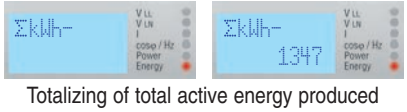
Three-phase apparent power

Value of Three-phase Apparent Power (VA)



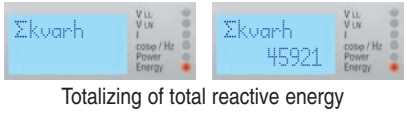
Totalizing of total active energy consumed

Total Active Energy consumed (kWh)



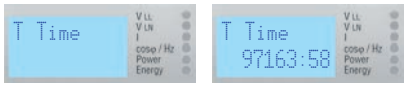
Totalizing of total active energy produced

Total active energy produced (kWh)



Totalizing of total reactive energy

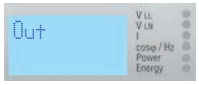
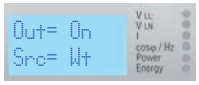
Total reactive energy (kvarh)



Total counter

The instrument’s operating time in hours and minutes (hhhhh:mm)

PRESSED BUTTON	WHEN RELEASED	DESCRIPTION
		Time since last reset in hours and minutes (hhhhh:mm)
Partial counter		

		**ONLY FOR "S" MODELS** Status of output relay contact (On=closed) and source of the threshold
Relay		

OPERATION OF THE PROGRAMMABLE THRESHOLD. The "S" models allow you to apply a max or min threshold as a percentage of the required size, in relation to its intended full scale.

Required size (Th1 Src)	Full scale (= 100.0%)	Description	Required size (Th1 Src)	Full scale (= 100.0%)	Description
W+	Inom * Vnom * 3	Max/Min instantly consumed active power	V1	Vnom	Max/Min V1
W-	Inom * Vnom * 3	Max/Min instantly produced active power	V2	Vnom	Max or Min of V2
Hz	100Hz	Max/Min frequency measured on V1	V3	Vnom	Max or Min of V3
3Vp	Vnom * 1,73	Max/Min of one phase voltage	3A	Inom	Max or Min of one phase current
V12	Vnom * 1,73	Max/Min of V12	A1	Inom	Max or Min of A1
V23	Vnom * 1,73	Max/Min of V23	A2	Inom	Max or Min of A2
V31	Vnom * 1,73	Max/Min of V31	A3	Inom	Max or Min of A3
3Vn	Vnom	Max/Min phase-to-neutral voltage	An	Inom * 3	Max or Min of An
DVp	Vnom * 1,73	Max/Min voltage asimmetry phase-phase			

Inom is the nominal value of current. For models 63 and 32 Inom = 63A; for models 16 and 10 Inom = 16A
Vnom is the nominal voltage phase/neutral = 231V

The threshold activation (threshold active) point is the condition "more than Th1 Val" if Th1 Sel = Hi; otherwise "less than Th1 Val" if Th1 Sel = Lo. The threshold's quiescent operating (threshold inactive) point is the condition "less than or equal to Th1 Val" if Th1 Sel=Hi; otherwise "more than or equal to Th1 Val" if Th1 Sel=Lo. The "active threshold" condition attempts to CLOSE the relay's "NO" contacts and this occurs instantly unless there is the delay Th1 Dly if Th1 DD is "Off-On". The "inactive threshold" condition attempts to OPEN the relay's "NO" contacts and this occurs instantly unless there is the delay Th1 Dly if Th1 DD is "On-Off".

There are 2 cases whereby the output relay does NOT mirror the threshold condition. These are as follows:

- During the first 10 seconds from starting up the instrument, when the relay is kept inactive to avoid unwanted operation while the measurements are stabilized, and
- when the settings are being programmed on the keypad, it is kept at the same status at the time of starting the procedure, to prevent partial modification of the settings from causing unwanted change to its status.

Relay status is shown on the display at page "OUT", together with the title of the size of the threshold selected in Th1 Src.
Closing of the relay also determines flashing of the LED associated with the selected size (when applicable), providing the selected measurement page is not the one associated with the LED, in which case the LED light remains steady.

"S485" Models: when Th1 Sel=OFF (threshold OFF), there is the option of controlling the relay directly by means of MODBUS commands to open and close INSTANTLY, regardless of the Th1 Dly and Th1 DD settings. "Src=REM"(REMOTE) appears on the OUT page to indicate remote access of the relay.

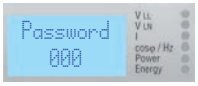
PROGRAMMING

For programming, press and hold the RIGHT-HAND button (for 4 seconds or more). The first page to appear when you are granted access to the programming mode is the one of programmable values. Releasing the button will make the display flash (to indicate you are in programming mode) and the pages begin to scroll through slowly (one every 4 seconds or so), indicating the title and value of the current set-point. If you do not touch the button when you get the last page, normal operation is restored without saving any changes. To make a change, simply press one of the buttons when the required page appears, respectively:

LEFT-HAND button = DECREASES the value; **RIGHT-HAND button** = INCREASES the value.

At that point (after pressing the button) the display remains steady so you can check the modification and the value changes by one unit. If you have to modify a value quite considerably, you can press and hold the button for more than 2 seconds to speed up the process. The longer you hold down the button, the faster you can scroll through the numbers (4 speeds). They are all "roll" values so when you get to the maximum permitted value you restarted from the minimum value, and vice versa. When you have set the value as required, release the button and wait for over 4 seconds. The pages then continue scrolling and the modification is automatically saved. Modifiable pages then follow.

indicates you have entered the setting configuration phase.



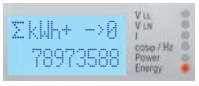
A password is only requested if NewPassw is set at a value other than 0 (see below).
Select the correct number and wait for the next page. In the case of a missing or incorrect entry, the instrument returns to normal operation after about 4 seconds.

By pressing a key when this page is shown, all value parameters return equal to the factory programming, except totalizer resetting one by one.

Average of the analog values measured (V, A and P). To stabilize the displayed values.
The higher the number, more of the measurements are stable – although they will be slow to update.
Settable between 1 and 15 at steps of 1. Default = 3

Configuration of the first measurement page to be viewed upon start-up. Using the buttons to scroll through displays the "titles" of the available pages – the same ones that appear when you press the right-hand button in sequence.
Settable on all the available pages. **Default = Blackout detection page, if available, otherwise the INFO page.**

Setting this at zero disables password protection for programming with the keypad. The same applies for password protection for programming by remote control. Settable between 0 and 999 at steps of 1.
Default = 0 (disabled)

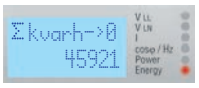


Resetting the Totalizer of the Total Active Energy consumed

Pressing and holding the right-hand button for more than 4 seconds reset the value

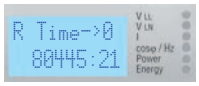
Resetting the Totalizer of the Total Active Energy produced

Pressing and holding the right-hand button for more than 4 seconds reset the value



Resetting the Totalizer of the Total Reactive Energy

Pressing and holding the right-hand button for more than 4 seconds reset the value



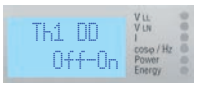
Resetting the Partial counter

Pressing and holding the right-hand button for more than 4 seconds reset the value

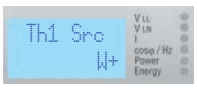
THE WINDOWS BELOW APPLY ONLY TO THE "S" MODELS

Selecting the threshold operation mode. Settable between: Hi=High threshold, Lo=Low threshold and Off=threshold disabled. If the threshold is OFF, you will not view the following pages. **Default = Hi (high threshold).**

Delay time for activation of the output relay (page displayed only if Th1 Sel is not Off)
In seconds. Settable between 0.0 and 25.5 in steps of 0.1. **Default = 0.1**



Assigning the delay time for activating the threshold (page displayed only if Th1 Sel is not Off)
The delay time is applicable from the start of threshold activation (Off-On) or at the end (On-Off). **Default = Off-On (at the start)**



Assigning the size for activating the threshold (page displayed only if Th1 Sel is not Off)
Settable at: W+, W-, Hz, 3Vf, V12, V23, V31, 3Vn, V1, V2, V3, 3A, A1, A2, A3,An. **Default = W+**

Regulating the threshold value as a percentage of the full scale (page displayed only if Th1 Sel is not Off)

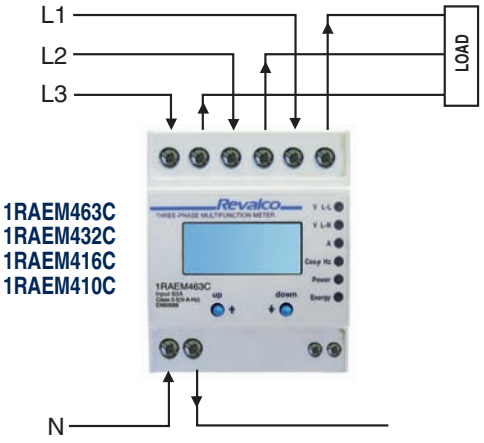
At the top is the effective value of the threshold for the selected size. Settable between: 0.0 and 100.0, in steps of 0.1.
Default = 50.0(%)

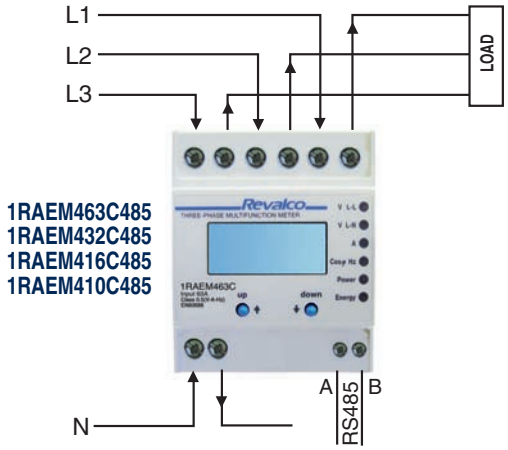
THE WINDOWS BELOW APPLY ONLY TO THE "485" MODELS

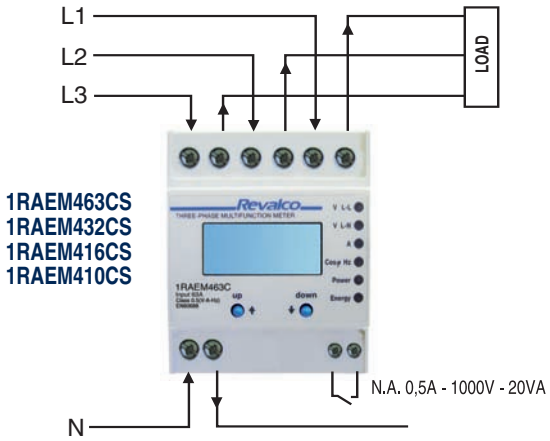
Assigning the MODBUS address node number (of the "INFO" page). Settable between 1 and 255. **Default = 1**

Configuring the speed of the RS485 serial port (bps).
Settable between 0 and 4 **Default = 4**
(0=9600, 1=19200, 2=38400, 3=57600, 4=115200)

CONNECTION DIAGRAMS







LCD MULTIFUNCTION METERS - 4 DIN MODULES D.C. VERSION

DIMENSIONS in mm

- Weight kg 0,70
- Sealable terminals cover included

GENERAL DESCRIPTION

The 4 DIN instrument is suited for use in industrial and civil market, specially on sectors related to the production of alternative energy (photovoltaic, wind energy) . Simple and extremely compact, it features an alphanumerical display with 2 lines of eight-character lines, 6 auxiliary LEDS and 2 buttons for display selection and keyboard programming. The machine is extremely user-friendly and information is presented clearly on the display. It is unlikely you will need to consult instruction manual which is not generally kept readily available at the site. When properly installed, the instrument measures the current from external shunt ..60mV. The instruments have the possibility to select the current end scale value between 5,0 A to 3000 A DC by steps of 5,0A.

Two principal families (direct and "H" insertion) forecast respectively the voltmeter measure in DC direct insertion (-800,.0 / + 800,0 VDC) or by external voltage divider …../ 100VDC. Other executions can be manufactured on request (ex. 24VDC, 48VDC, 150VDC etc) but must be considered as "special executions" with different costs. The instruments related to "H" family have the possibility to select the voltage end scale value between 10.0V to 3000 V DC by steps of 1,0V.

The high accuracy class measures offered by each instrument are the most used on the DC field. Every direct measure (Voltage, Current and Power) is bidirectional; so the inversion of polarity is shown and the measured range is the same in positive or negative case; practically if the end scale is 3000.0A, these instruments are able to measure from + 3000,0A to – 3000,0 ADC.

The individually resettable Energies and Ampere Hour can be easily calculated when you need to service the system and/or periodical test line operation, determine zone consumption values, establish cost centres, etc.

NOTE: The instruments use simple Energy and Ampere Hour totalizing methods for purposes of diagnostics and statistics. These instruments cannot be considered as substitute of Energy kWhmeters.

The following are provided according to model:

1 threshold with output on "N.O." control relay (500mA/1000V), fully programmable (model "S")

1 x RS485 3kV optoinsulated programmable high speed interface with MODBUS RTU protocol (model "RS485)

PARAMETERS

Electrical parameters	1RAEM4C DC	1RAEM4C SDC	1RAEM4C 485DC	1RAEM4C S485DC	1RAEM4C HDC	1RAEM4C HSDC	1RAEM4C H485DC	1RAEM4C HS485DC
- DC Voltage 800.0 V max	●	●	●	●				
- DC Voltage ..../100V by divider					●	●	●	●
- DC Current .../60mV	●	●	●	●	●	●	●	●
- Bidirectional power (kW)	●	●	●	●	●	●	●	●
- Total active energy (Import) resettable parameter	●	●	●	●	●	●	●	●
- Total active energy (Export) resettable parameter	●	●	●	●	●	●	●	●
- Ampère-hour Ah+ (Import) resettable parameter	●	●	●	●	●	●	●	●
- Ampère-hour Ah- (Export) resettable parameter	●	●	●	●	●	●	●	●
- Total working hours	●	●	●	●	●	●	●	●
- Partial working hours settable parameter	●	●	●	●	●	●	●	●
- Indication of failed voltage supply	●	●	●	●	●	●	●	●
- Programmed threshold V-A-W		●		●		●		●
- Output relay NO (500mA/1000V)		●		●		●		●
- Threshold activation signal		●		●		●		●
- Threshold status summary page		●		●		●		●
- Interface RS485 3kV optoinsulated 9600...115200bps			●	●			●	●
- MODBUS SLAVE RTU full compliance			●	●			●	●
- Remote configurable settings			●	●			●	●
- Keypad configurable settings	●	●	●	●	●	●	●	●
- Remote resetting of energies - ampere/hour - counter			●	●			●	●
- Remote relay output control (if the threshold is OFF)				●				●
- Configurable password for access to programming	●	●	●	●	●	●	●	●
- Restore factory settings	●	●	●	●	●	●	●	●
- Programming of initial page upon start-up	●	●	●	●	●	●	●	●
- Programming of current 5 to 3000ADC with step of 5A	●	●	●	●	●	●	●	●
- Programming of voltage from 10 to 3000.0VDC step 1V					●	●	●	●
- Programming of analog average (VDC, ADC and W)	●	●	●	●	●	●	●	●

- Download the software for free from our website www.revalco.it

TECHNICAL SPECIFICATIONS

Auxiliary power supply

- UAUX nominal value	110	110V 50/60Hz
	230	230V 50/60 Hz
	-P1	22...36VAC and 19...70VDC
	-P2	44...130VAC and 70....240VDC

- max rated consumption 2 VA

Voltmeter measuring circuits (instrument for direct insertion)

- Max applicable voltage (Vmax)	+/- 960 VDC
- Rated voltage measurement (Vnom)	+/- 800 VDC
- Direct measuring field	+/- 960 VDC
- Input impedance of voltage circuit	approx 2MΩ
-Accuracy class	0.2% *2Vmax ± 2 digits

Voltmeter measuring circuits
(models "H" instruments; insertion from Voltage divider… /100VDC)

- Max. applicable voltage (Vmax)	+/- 125 mVDC
- Rated voltage measurement (Vnom)	+/- 100 mVDC
- Direct measuring range	+/- 125 mVDC.
- Imput impedance	about 250 KΩ
- End scale Range FsV	+/-10VDC.....+/-3000VDC step 1V
-Accuracy Class	0.2%*Vmax ± 2 digit

Ammeter measuring circuits for Shunt …/60mV

- Max applicable current (Vmax)	+/- 72 mVDC
- Rated voltage measurement (Vnom)	+/- 60 mVDC
- Direct measuring range	+/- 72 mVDC.
- Imput impedance	about 50 KΩ
- End scale Range FsA	+/-15ADC.....+/-3000ADC step 5A
-Accuracy Class	0.2%*2Vmax ± 2 digit

Power measurement

- Measurement capacity for direct insertion (end scale)	±3,57 MW
- Measurement capacity for "H" models (end scale)	±12,96 MW
-Accuracy class	0,5 % full scale ± 2 digits

Energy totalizing

- Counting capacity	99999999kWh
- Counting period	15 minutes
- Reset	YES
-Accuracy class	2 % max.

Ampere-Hour totalizing

- Counting capacity	99999999 Ah
- Counting period	15 minutes
- Reset	YES
-Accuracy class	2 % max.

Operating counter

- Counting capacity	99999:59 hhhhhh:mm
- Counting period	15 minutes
- Reset	NO
Accuracy class	2 % max.

Partial counter

- Counting capacity	99999:59 hhhhhh:mm
- Counting period	15 minutes
- Reset	YES
Accuracy class	2 % max.

Screens

- Back-lighted Display LCD, 8 characters x 2 lines, temp. -20°/+70°	
- Auxiliary signals	6 red LEDS

Relay control output ("S" models only)

- Type of contact	N.O.
- Contact specifications	1000VAC / 0.5A AC(resistive. load) / 20VA max
- Reel-contact insulation	4.25kVAC
- Remote operation via MODBUS	YES, only for "S485" models

RS485 serial interface ("RS485" models only)

- Insulation	3kV
- Max communication speed	115.200 bps
- Communication protocol MODBUS RTU	Full-compliant / JBUS
- Programmability and remote controls	YES

Special functions

- 3-digit password for programming the settings
- Black-out indicator system

Mechanical properties

- Dimensions	Standard 4 DIN modules
- Type of mounting	DIN50022 bar
- Degree of protection	complete device IP20
	Front IP30

Environmental conditions

- Operating temperature:	Nominal range 0...+45 °C
	Extreme range -5...+55 °C
- Storage temperature	-10...+70 °C
- Relative humidity	10...95 %
- Atmospheric pressure	70...110 kPa

Standards

- Safety CEI EN 61010-1 300V CAT III
- Accuracy class CEI EN 60688 (ex EN 50082-2)
- Electromagnetic compatibility (immunity) CEI EN 61000-6-2 (ex EN 50081-2)
- Electromagnetic compatibility (emission) CEI EN 61000-6-4
- Cover protection (IP code) CEI EN 60529

Modbus:

-Protocol specifications V1.1b, 28.12.2006

GENERAL OPERATION (FOR ALL MODELS)

The instrument calculates and monitors the electrical measurements of the plant to which it is connected. It displays the information on the selected pages of display by quick pressure of the buttons. The right button is for "next" and the left button is for "previous" page.

The 6 LEDS on the right help to indicate the main electrical measurement pages and switch on according to the type of measurement shown on the display at the time.

The first measurement page that appears upon start-up can be programmed.

The "S" models with threshold allow you to configure the measurement to be controlled, the type of threshold (off, maximum or minimum), the millesimal threshold value in relation to the full scale of the controlled measurement, time delay upon activation or deactivation, if applicable, and the time delay in tenths of a second up to 25.5 seconds (0=no delay). Refer to the "Programming" section for details on programming values and the "Operation of the programmable threshold" section.

The "RS485" models with RS485 interface can communicate via network when they are assigned a programmable address between 1 and 255. You are advised not to put more than 32 devices on a network so as to ensure reliable communication. If this is not adequate, there are "special" versions able to support more than 64 devices. Communication speed can be set at between 9600bps and 115,200bps.You are advised to set the communication speed at maximum if only these devices are used. If the speed is set too low and there are frequent requests and/or there is a high number of required records, interactions with the instrument may also slow down. Allmeasurements and parameters can be viewed on the MODBUS RTU reader interface.

The instrument also enables "on the fly" remote programming of the work settings via the MODBUS writer interface with the respective records that support it. In certain situations you are also allowed to carry out some macro-operations and controls, such as restoring the factory settings of models that enable this, resetting of the totalizers or direct switching on and off of the output relay for models with threshold.

Note: the "RS485" models offer additional measurements via MODBUS, in particular the TRUE RMS values to verify the presence or not of ripple or alternate components residuals.

All models feature a blackout indication page. It is like the measurement page but with flashing content which has to be programmed like the initial page shown on start-up.

When you press the keys to change the measurement page, the "blackout" condition is reset. This is proposed again after any programming of the settings on the keyboard. All models feature 2 hour counters; one for total operation and another that can be resetted. The latter allows you to check the average consumption if resetted together with one or more Energy totalizers.

All models require a 3-digit password (that can be excluded) to change the work settings and reset the counters.

This password is not intended to guarantee full protection but to prevent accidental access to the programming area and ensure the settings are not changed by someone not authorized to do so.

There is no easy way to recover or cancel a password that has been configured and then forgotten. You will have to try all the combinations or return the product to the factory for reprogramming.

NOTES AND OPERATING INSTRUCTIONS

DO NOT PRESS ANY OF THE KEYS while switching on the instrument (i.e. when connecting it to the auxiliary power supply).

Otherwise you may accidentally start the calibration procedure normally carried out at the factory which, if the instrument is connected to the system rather than to the respective calibration devices, could cause the instrument to be permanently not calibrated.

In the interest of safety, ALWAYS WAIT FOR THE INITIAL DIAGNOSTICSTO FINISH (scanning of the LEDS) before pressing any of the keys.

"S" instruments with threshold:
The threshold relay is blocked for the first ten seconds after the instrument is switched on.
The relay is "frozen" until you have finished configuring the settings.

1RAEM4C DC / ...SDC / ...485DC / ...S485DC
1RAEM4C HDC / ...HSDC / ...H485DC / ...HS485DC

OPERATION

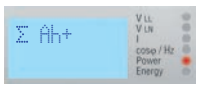
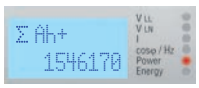
When you start up the device, the firmware information page appears for a few seconds and all the LEDS switch on in sequence (initial diagnostics).
You will then see, for a few seconds, the page with the "title" of the measurements that will appear on the display, and the respective LED will switch on if the page requires it to do so. When the first measurement page appears, you can press the buttons to scroll through the available pages.
You can scroll FORWARDS by QUICKLY PRESSING the RIGHT-HAND button, or BACKWARDS by pressing the LEFT-HAND button.
Pressing and holding the right-hand button will take you to the next page as well as allow you to program the instrument's settings.
Pressing one of the 2 buttons quickly displays the "title" of the measurement page to be displayed

The measurement and indication pages which can be accessed by pressing and Quickly releasing the RIGHT-HAND button are the follows:

Appears only for about 3 seconds when the instrument is switched on.
Provides information on the instrument's firmware and operating details.
When this page is displayed, the LEDS flash quickly to indicate they are working properly.

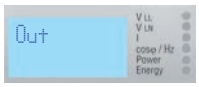
Black-out page. For this to appear, it has to be configured as the default page.
Appears only when the instrument is switched on. It disappears as soon as the display is moved.
It reappears after the settings are configured using the keypad.

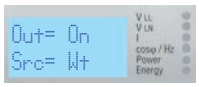
INFO page. Indicates the instrument model and version. The lightt-up square (first line on the right) indicates the voltage phases are OUT OF SEQUENCE. The square does not appear when the sequence is correct. Only in the case of the "RS485" models does the last value at the bottom on the right indicate the node number of the instrument on the MODBUS network.

PRESSED BUTTON	WHEN RELEASED	DESCRIPTION
DC Voltage measure		Value of DC Voltage component, with + or - (V)
DC Current measure		Value of DC Current component, with + or - (A)
DC Power measure		Value of DC Power component, with + or - (kW)
Positive Energy totalizing		Total positive Energy (kWh)
Negative Energy totalizing		Total negative Energy (kWh)
 Positive Ampere-hour totalizing		Total positive Ampere-hour (Ah)
Negative Ampere-hour totalizing		Total negative Ampere-hour (Ah)
Total counter		Operating time in hours and minutes (hhhhh:mm)

Time since last reset, in hours and minutes (hhhhh:mm)

Partial counter





FOR "S" MODELS ONLY

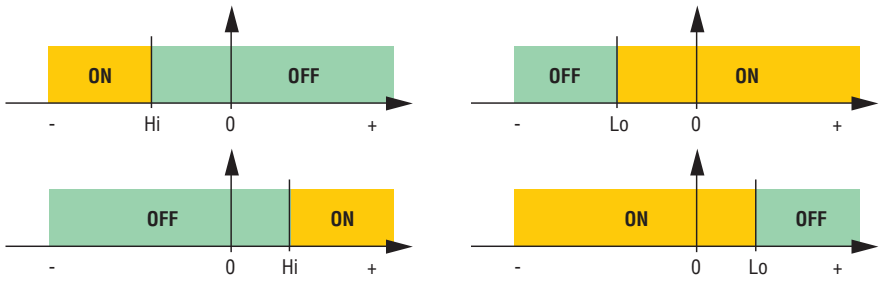
Status of output relay contact (On=closed) and source of the threshold

Relay

OPERATION OF THE PROGRAMMABLE THRESHOLD ("S" models only). These models allow you to apply a max or min threshold as a percentage of the required size, in relation toits intended full scale.

Required parameter (Th1 Src)	Full scale (= 100.0%)	Description
kW+	FsA * FsV	Max/Min instantly consumed positive Active Power
kW-	FsA * FsV	Max/Min instantly consumed negative Active Power
A+	FsA	Max/Min positive current
A-	FsA	Max/Min negative current
V+	FsV	Max/Min positive voltage
V-	FsV	Max/Min negative voltage

The threshold activation (threshold active) point is the condition "more than Th1 Val" if Th1 Sel = Hi; otherwise "less than Th1 Val" if Th1 Sel = Lo
The threshold's quiescent operating (threshold inactive) point is the condition "less than or equal to Th1 Val" if Th1 Sel=Hi; otherwise "more than or equal to Th1 Val" if Th1 Sel=Lo.



The "active threshold" condition attempts to CLOSE the relay's "N.O." contacts and this occurs instantly unless there is the delay Th1 Dly if Th1 DD is "Off-On"
The "inactive threshold" condition attempts to OPEN the relay's "N.O." contacts and this occurs instantly unless there is the delay Th1 Dly if Th1 DD is "On-Off".

There are 2 cases whereby the output relay does NOT mirror the threshold condition. These are as follows:
- During the first 10 seconds from starting up the instrument, when the relay is kept inactive to avoid unwanted operation while the measurements are stabilized, and
- when the settings are being programmed on the keypad, it is kept at the same status at the time of starting the procedure, to prevent partial modification of the settings from causing unwanted change to its status.

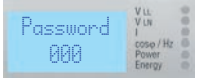
Relay status is shown on the display at page "OUT", together with the title of the size of the threshold selected in Th1 Src.
Closing of the relay also determines flashing of the LED associated with the selected size (when applicable), providing the selected measurement page is not the one associated with the LED, in which case the LED light remains steady.

"RS485" Models:
when Th1 Sel=OFF (threshold OFF), there is the option of controlling the relay directly by means of MODBUS commands to open and close INSTANTLY, regardless of the Th1 Dly and Th1 DD settings. "Src=REM"(REMOTE) appears on the OUT page to indicate remote access of the relay.

PROGRAMMING

For programming, press and hold the RIGHT-HAND button (for 4 seconds or more). The first page to appear when you are granted access to the programming mode is the one of programmable values. Releasing the button will make the display flash (to indicate you are in programming mode) and the pages begin to scroll through slowly (one every 4 seconds or so), indicating the title and value of the current set-point. If you do not touch the button when you get the last page, normal operation is restored without saving any changes. To make a change, simply press one of the buttons when the required page appears, respectively:
LEFT-HAND button = DECREASES the value; **RIGHT-HAND** button = INCREASES the value.
At that point (after pressing the button) the display remains steady so you can check the modification and the value changes by one unit. If you have to modify a value quite considerably, you can press and hold the button for more than 2 seconds to speed up the process. The longer you hold down the button, the faster you can scroll through the numbers (4 speeds). They are all "roll" values so when you get to the maximum permitted value you restarted from the minimum value, and vice versa. When you have set the value as required, release the button and wait for over 4 seconds. The pages then continue scrolling and the modification is automatically saved. Modifiable pages then follow.

Indicates you have entered the setting configuration phase.



A password is only requested if NewPassw is set at a value other than 0 (see below).
Select the correct number and wait for the next page. In the case of a missing or incorrect entry, the instrument returns to normal operation after about 4 seconds.

By pressing a key when this page is shown, all value parameters return equal to the factory programming, except totalizer resetting one by one.

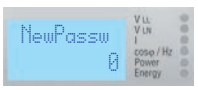
To set the Current end scale value (…./60mVDC)in Ampere. Settable between 5 and 3000 at steps of 5
Default = 100

THE WINDOWS BELOW APPLY ONLY TO THE "H" MODELS

To select the Voltage end scale value from voltage divider. Selectable from 10.0V to 3000 V DC by steps of 1,0V.
Default=100

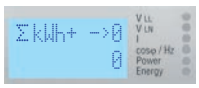
Average of the analogue values measured (V, A and P). To stabilize the displayed values. More higher is the number, more stable are the measurements , although they will be slow to update. Settable between 1 and 15 at steps of 1. Default = 25

Configuration of the first measurement page to be viewed upon start-up. Using the buttons to scroll through displays the "titles" of the available pages – the same ones that appear when you press the right-hand button in sequence.
Settable on all the available pages. Default = Blackout detection page

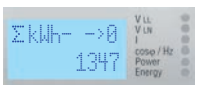


Setting this at zero disables password protection for programming with the keypad. The same applies for password protection for programming by remote control. Settable between 0 and 999 at steps of 1.
Default = 0 (disabled)

Resetting the Totalizer of positive Energy



Pressing and holding the right-hand button for more than 4 seconds, the value will be resetted



Resetting the Totalizer of negative Energy

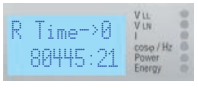
Pressing and holding the right-hand button for more than 4 seconds, the value will be resetted

Resetting the Totalizer of positive Ampere-hour

Pressing and holding the right-hand button for more than 4 seconds, the value will be resetted

Resetting the Totalizer of negative Ampere-hour

Pressing and holding the right-hand button for more. than 4 seconds, the value will be resetted



Resetting the Partial counter

Pressing and holding the right-hand button for more than 4 seconds, the value will be resetted

THE WINDOWS BELOW APPLY ONLY TO THE "S" MODELS

Selecting the threshold operation mode. Settable between: Hi=High threshold, Lo=Low threshold and Off=threshold disabled.
If the threshold is OFF, you will not view the following pages**. Default = Hi (high threshold).**

Delay time for activation of the output relay (page displayed only if Th1 Sel is not Off)
Expressed in seconds. Settable between 0.0 and 25.5 in steps of 0.1. **Default = 0.1**

Assigning the delay time for activating the threshold (page displayed only if Th1 Sel is not Off)
The delay time is applicable from the start of threshold activation (Off-On) or at the end (On-Off). **Default = Off-On (at the start)**

Assigning the size for activating the threshold (page displayed only if Th1 Sel is not Off)
Settable at: kW +, k W -, V+, V-, A +, A -. **Default =k W+**

Regulating the threshold value as a percentage of the full scale
(page displayed only if Th1 Sel is not Off)

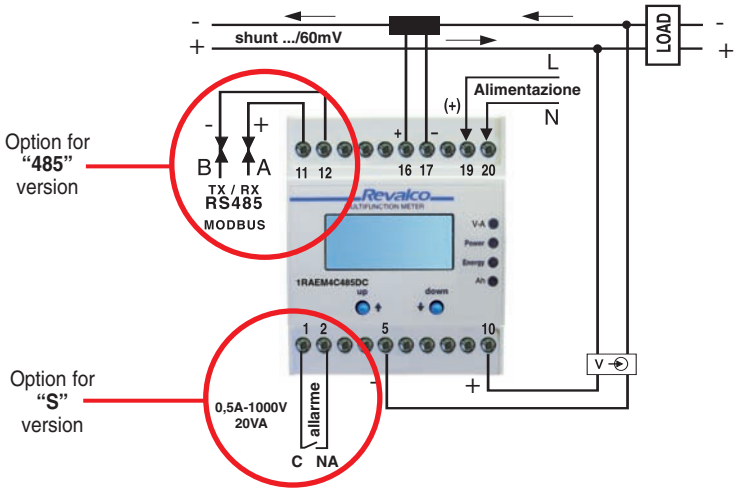
At the top is the effective value of the threshold for the selected parameter. Settable between: 0.0 and 100.0, in steps of 0.1. **Default = 50.0 (%)**

THE WINDOWS BELOW APPLY ONLY TO THE "485" MODELS

Assigning the MODBUS address node number (of the "INFO", ADR: nnn page).
Settable between 1 and 255. **Default = 1**

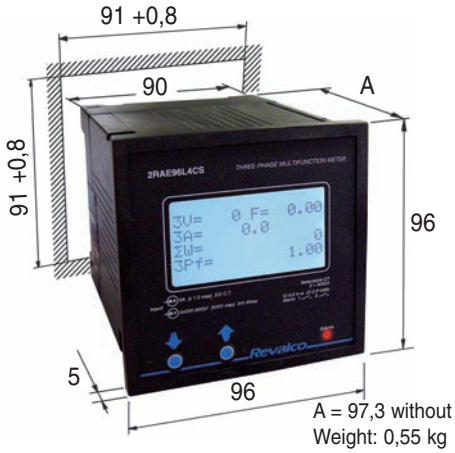
Configuring the speed of the RS485 serial port (bps)
Settable between 0 and 4 (0=9600, 1=19200, 2=38400, 3=57600, 4=115200). **Default = 4**

CONNECTION DIAGRAM

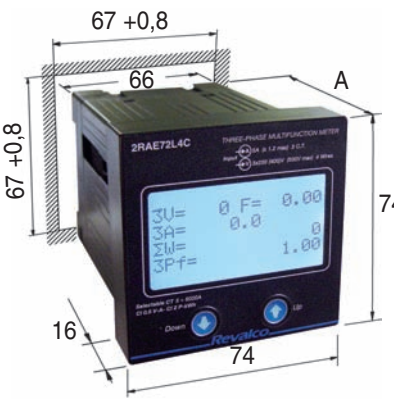


THREE PHASE LCD 4 LINES (LED 7 display) MULTIFUNCTION METERS - TRUE RMS

DIMENSIONS in mm



A = 97,3 without terminals cover A = 107 with terminals cover
Weight: 0,55 kg



A = 82 without terminals cover A = 97 with terminals cover
Weight: 0,50 kg

TECHNICAL CHARACTERISTICS

⚠ **Instruments available with secondary current 1A and prices on request. The ordering code is obtained changing ..L4.. with ..L1... Example: 2RAE96L1C**

96X96 VERSION - 7 LED DISPLAYES 96X96 VERSION 72X72 VERSION	2RAE96L7C 2RAE96L4C 2RAE72L4C*	2RAE96L7CS 2RAE96L4CS	2RAE96L7C485* 2RAE96L4C485* 2RAE72L4C485	2RAE96L7CS485* 2RAE96L4CS485*
- **PARAMETERS**				
- Ph-N voltage and Ph-Ph voltage	●	●	●	●
- Medium voltage of phases	●	●	●	●
- Current	●	●	●	●
- Power factor	●	●	●	●
- Total equivalent power factor	●	●	●	●
- Apparent power / Active power (+/-) / Reactive power	●	●	●	●
- Total Apparent power / - Total Active power (+/-) / Total Reactive power	●	●	●	●
- Frequency	●	●	●	●
- Total Active Energy (import) resettable parameter	●	●	●	●
- Total Active Energy (export) resettable parameter	●	●	●	●
- Reactive Total energy resettable parameter	●	●	●	●
- Total working time resettable parameter	●	●	●	●
- Partial working time parametro azzerabile	●	●	●	●
- Sequence of phases	●	●	●	●
- Voltage asymmetry (Ph-N)	●	●	●	●
- **TWO ALARM OUTPUT RELAYS** (contact N.O. 1000V-0,5A-20VA)		●		●
- **PROTOCOL MODBUS SLAVE RTU**				
Baude rate 9600 - 19200 - 38400 - 56800 - 115200			●	●
- **The software is available, free of charge, on our internet address www.revalco.it**			●	●
- **PERMANENT MEMORY FOR SET POINT AND ENERGIES** (EEPROM)	●	●	●	●
- **400V insertion, 3 or 4 wires line, 2 or 3 systems** (pages 121/122 and 125)	2RAE96L4CH1 2RAE72L4CH1		2RAE72L4C485H1	2RAE96L4CS485H1*
- **VT..../100V insertion, 3 or 4 wires line, 2 or 3 systems** (pages 121/122 and 125) ⚠ Primary voltage up to 9,9 kV	2RAE96L4CH2 2RAE72L4CH2		2RAE72L4C485H2	2RAE96L4CS485H2*
- **VT..../100V insertion, 3 or 4 wires line, 2 or 3 systems** (pages 121/122 and 125) ⚠ Primary voltage from 10 to 100 kV	2RAE96L4CH3 2RAE72L4CH3		2RAE72L4C485H3	2RAE96L4CS485H3*

* **ETHERNET OPTION** from serial transducer **(suffix ETH2S)** - * **ETHERNET OPTION** from web server **(suffix ETH2WS)**
* **PROFIBUS OPTION (suffix PROF) not for code 2RAE72L4C**

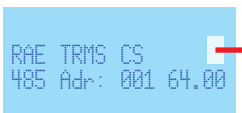
2RAE72L4C / 2RAE72L4C485 - 2RAE96L4C / 2RAE96L4C485

OPERATION

- Powering the instrument you can see the following page

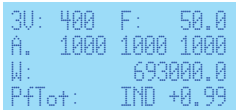
First powering page. A different page can be selected within the available page present on this type. At first powering the display shows automatically this page

- By pressing “UP” front button, the introduction page appears showing: instruments type, interface type, node number and software release.

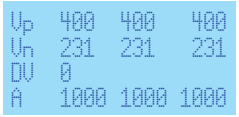


Correct sequence of phases indication.
Light OFF = correct sequence

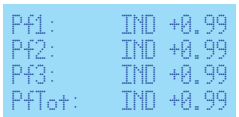
- By pressing again “UP” front button, the page shows phase-phase Medium Voltage values, Frequency, 3 Currents L1-L2-L3, Total Active Power and Total Power Factor (Cosφ).



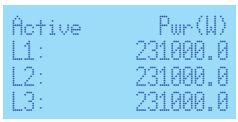
- By pressing again “UP” front button, the page shows the phase-phase Voltage L12-L23-L31, phase-neutral Voltages L1-L2-L3, Phase-Neutral asimmetry Voltage and 3 Currents L1-L2-L3.



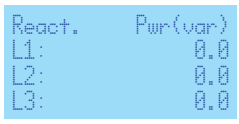
- By pressing again “UP” front button, the page shows Power Factor (Cosφ) of each phase and the Total Power Factor (Cosφ).



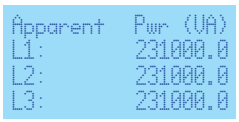
- By pressing again “UP” front button, the page shows the Active Powers of L1-L2-L3.

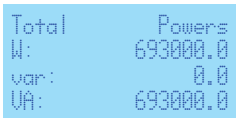


- By pressing again “UP” front button, the page shows the Reactive Powers of L1-L2-L3.

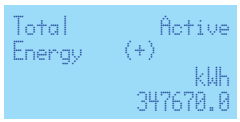


- By pressing again “UP” front button, the page shows the Apparent Powers L1-L2-L3.



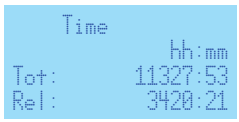


- By pressing again “UP” front button, the page shows the Total Powers (Active, Reactive and Apparent).
- By pressing again “UP” front button, the page shows the Active Energy (Import +). Settable parameter from programming page



- By pressing again “UP” front button, the page shows the Active Energy (Export -). Settable parameter from programming page

- By pressing again “UP” front button, the page shows the Total Active Energy. Settable parameter from programming page
- By pressing again “UP” front button, the page shows the Total and Partial Working Time
  Partial working time is a settable from programming page



PARTICULAR VISUALIZATIONS RELATED TO THE POWER FACTOR

- When Apparent Power is “0” some lines are displayed
- When Cosφ = 1 the mark is displayed
- When Cosφ = 0 no mark is displayed
- 2nd quadrant indication (seling Power) has φ = 120°

CONFIGURATION SELECTION MENU’

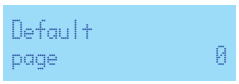
- To enter in programming phase press the right-hand button (UP) more than 4 seconds. “Program Mode” page will be displayed and after 4 seconds the other pages with actual values will be showed. If it is necessary to modify the parameters, press the button when it appears on the display. To increase the value press “UP” to decrease it press “DOWN”. Maintaining pressure on the button the sliding is automatic and the speed increase automatically; once the needed value is displayed release the button (the new value will be saved in a permanent memory)
- **INPUT PASSWORD ADMITTING**
  This page will be displayed only if parameter “Password” was modified and it is different from “000”. To enter in programming phase it is necessary to write the same memorized number otherwise you’ll go out from this page

- **CURRENT TRANSFORMER SELECTION (.../5A or .../1A)**
  In this page it is possible to select the primary value of CT in Ampere and it represent the end scale value of currents when 5A or 1A income. The possible range is from 5A to 6000A with 5A steps.
  The default value is 1000A.

- **VOLTAGE TRANSFORMER SELECTION (.../100V)**
  In this page it is possible to select the primary value of VT in Volts and it represent the end scale value of voltage when 100V income. Directly connected, this is the value of Phase-Neutral nominal voltage.
  The possible range is from 50V to 4615V (8000V for Phase-Phase voltage V-ff). The default value 231V

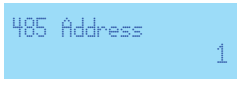
- **AVERAGE**
  In this page it is possible to select the reading numbers to which calculate the medium value. Practically it is the stability filter of measurements. Increasing the number, stability increases too. Regulation is possible from 1 to 15 and the default number is 3.

- **DEFAULT PAGE**
  First powering page. A different page can be selected within the available pages.
  The default page is 0.

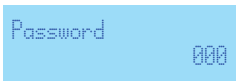


- **SERIAL PORT SPEED**
  In this page it is possible to select the interface type which changes by the model chosen.
  The meaning table is: 0= 9600 - 1=19200 – 2=38400 – 3=57600 – 4 =115200 bps. Default number is “0”

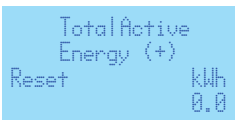
- **NODE ADDRESS (MODBUS PROTOCOL)**
  It is the instrument identification number for serial communications in the net.
  The address numbers are included from 1 to 255. Default value is 1.

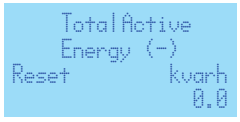


- **PASSWORD**
  In this page it is possible to change the password in order to be able to enter in programming pages; it is constituted by 3 numbers between 000 and 999. Default value is “000”



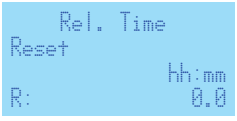
- **POSITIVE ACTIVE ENERGY RESET**
  It is enough to press one of the button to reset the value



- 

NEGATIVE ACTIVE ENERGY RESET
It is enough to press one of the button to reset the value

- **REACTIVE ENERGY RESET**
  It is enough to press one of the button to reset the value

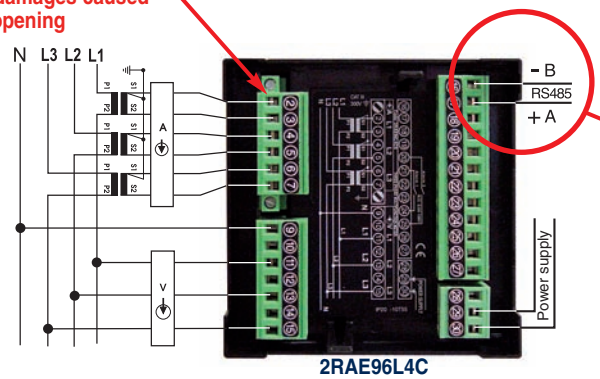
- 

PARTIAL HOURS RESET
It is enough to press one of the button to reset the value

CONNECTION DIAGRAMS 96x96

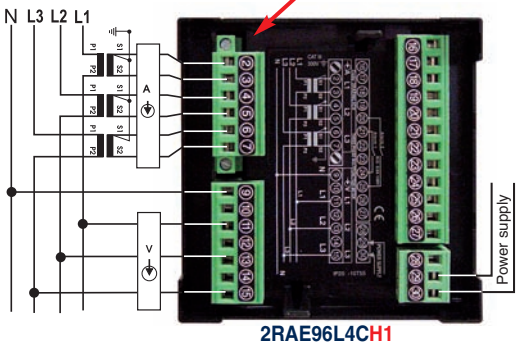
NEW

Differently from the others, the CT connecting terminal is fixed to avoid errors of insertion or damages caused by a possible secondary terminals CT opening

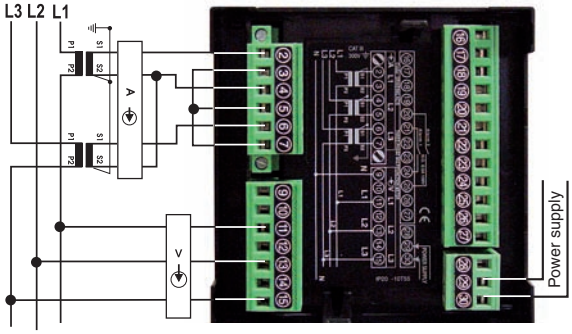


Option for **2RAE96L4C485** version

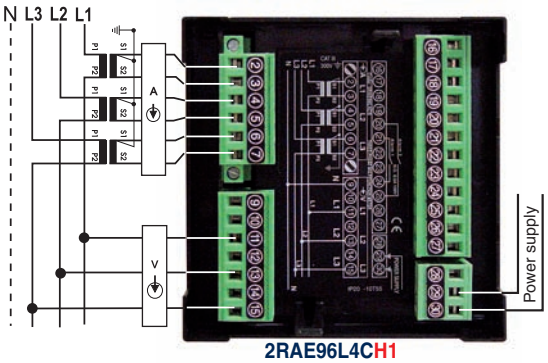
2RAE96L4C
INSERTION WITH NEUTRAL



2RAE96L4CH1
INSERTION WITH NEUTRAL



2RAE96L4CH1
ARON INSERTION

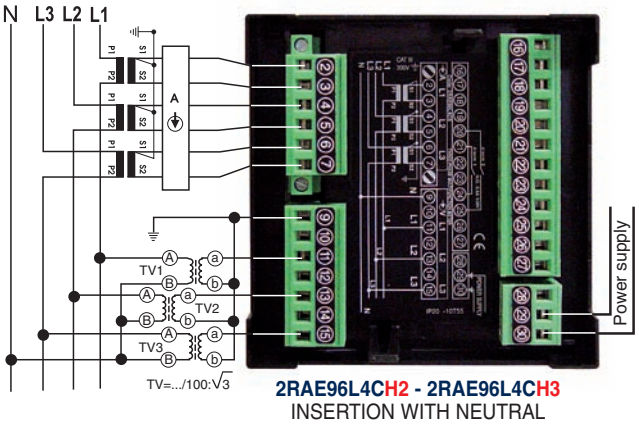


2RAE96L4CH1
INSERTION WITHOUT NEUTRAL

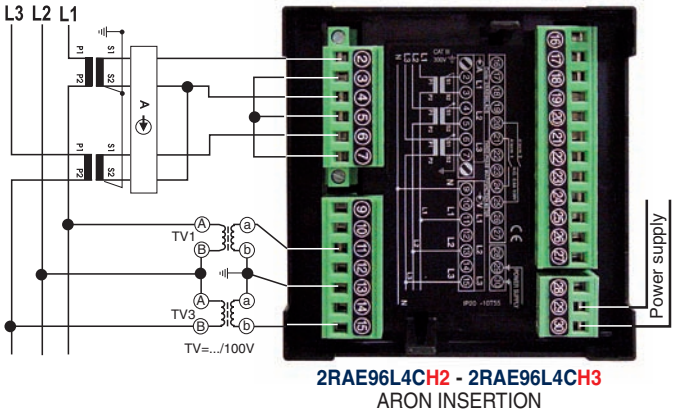
The same instrument can be connected in three different ways. For this reason (into the packing box) you'll find 3 different connection labels. So depending by the chosen connection the customer has to fix the proper label on the back side of instrument

VT CONNECTION DIAGRAMS 96x96

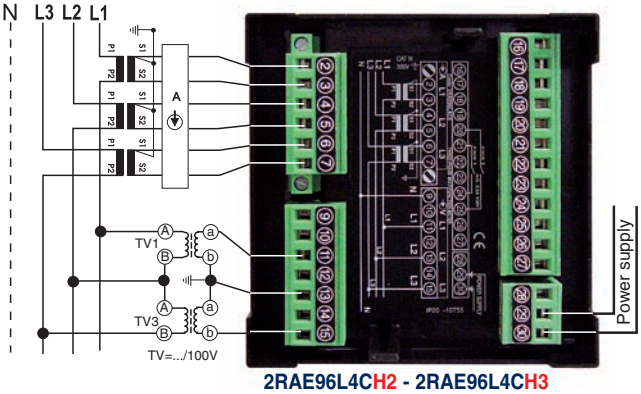
- Instruments with code ...CH2 show primary voltages up to 9,9kV
- Instruments with code ...CH3 show primary voltages from 10kV to 100kV



2RAE96L4CH2 - 2RAE96L4CH3
INSERTION WITH NEUTRAL



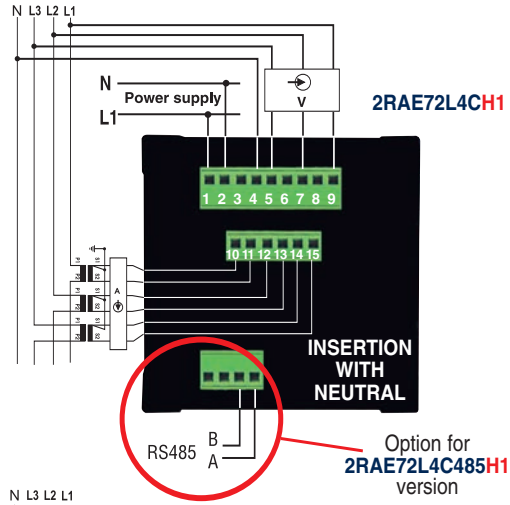
2RAE96L4CH2 - 2RAE96L4CH3
ARON INSERTION



2RAE96L4CH2 - 2RAE96L4CH3
INSERTION WITHOUT NEUTRAL

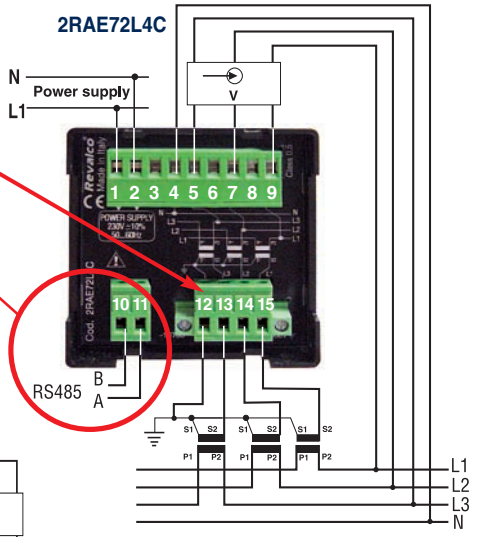
The same instrument can be connected in three different ways. For this reason (into the packing box) you'll find 3 different connection labels. So depending by the chosen connection the customer has to fix the proper label on the back side of instrument

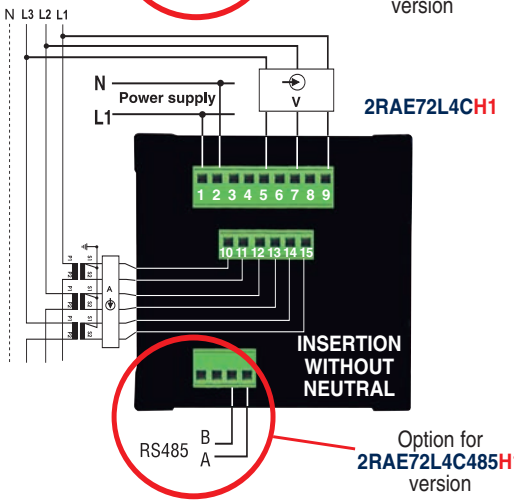
CONNECTION DIAGRAMS 72x72

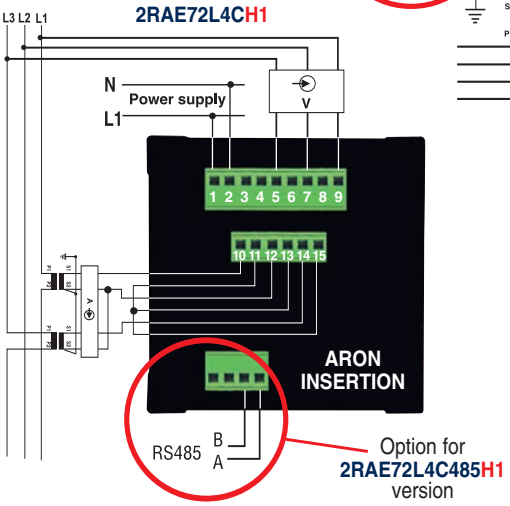


Differently from the others, the CT connecting terminal is fixed to avoid errors of insertion or damages caused by a possible secondary terminals CT opening

NEW



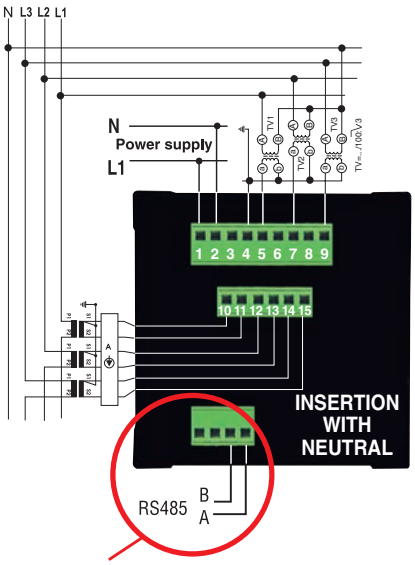


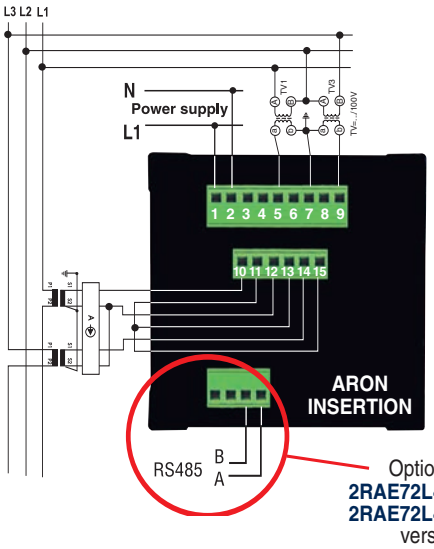


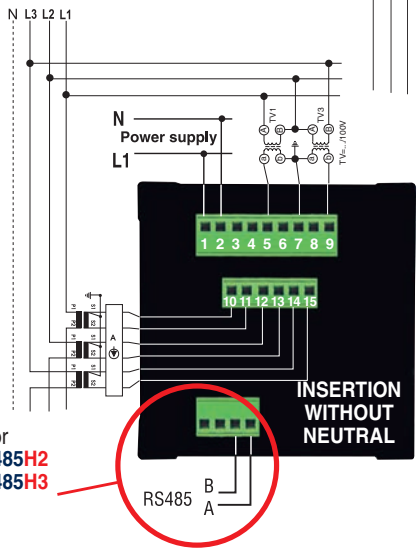
The same instrument can be connected in three different ways. For this reason (into the packing box) you'll find 3 different connection labels. So depending by the chosen connection the customer has to fix the proper label on the back side of instrument

VT CONNECTION DIAGRAMS 72x72

- The same instrument can be connected in three different ways. For this reason (into the packing box) you'll find 3 different connection labels. So depending by the chosen connection the customer has to fix the proper label on the back side of instrument
- Instruments with code ...CH2 show primary voltages up to 9,9kV
- Instruments with code ...CH3 show primary voltages from 10kV to 100kV







2RAE96L4CS / 2RAE96L4CS485

OPERATION

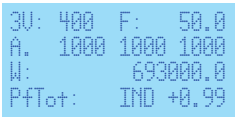
- Powering the instrument you can see the following page

This is the first powering page. A different page can be selected within the available page present. At first powering the display shows automatically this page

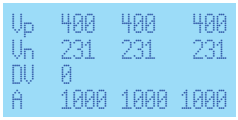
- By pressing the frontal button “UP” the first page appears indicating: instrument code, interface type, node number and software revision

Correct sequence of phases indication
light-out = correct sequence

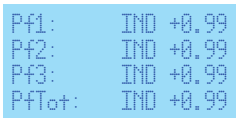
- By pressing again the frontal button “UP”, the second page appears showing the 3 phase-phase voltages (medium value, Frequency, 3 currents L1 L2 L3, Total Active Power and Total Power Factor.



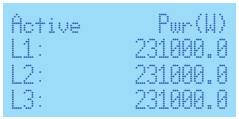
- By pressing again the frontal button “UP”, the third page appears showing the 3 phase-phase voltages L12-L23-L31, 3 phase-neutral voltages L1-L2-L3, difference of the phase-neutral voltages (asymmetry) and 3 currents L1 L2 L3.



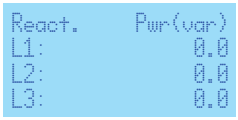
- By pressing again the frontal button “UP”, the fourth page appears indicating the phase-phase and total Power Factor.



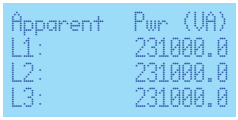
- The fifth page will display the L1-L2-L3 Active Powers



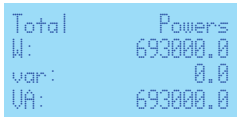
- The sixth page will display the L1-L2-L3 Reactive Powers



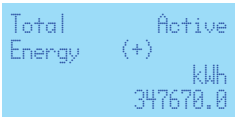
- The seventh page will display the L1-L2-L3 Apparent Powers



- By pressing again the frontal button “UP”, the new page appears showing the all powers (Active, Reactive and Apparent)



- By pressing again the frontal button “UP”, the new page appears indicating the Active Energy (Import +). It is possible to reset this parameter on the programming page.



- By pressing again the frontal button “UP”, the new page appears indicating the Active Energy (Export -). It is possible to reset this parameter on the programming page.

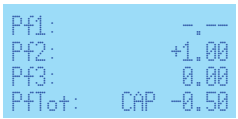
- By pressing again the frontal button “UP”, the eleventh page appears indicating the Total Reactive Energy. It is possible to reset this parameter on the programming page.

- By pressing again the frontal button “UP”, the new page appears indicating the Total and Partial hours counters It is possible to reset the Partial hours parameter on the programming page.

- By pressing again the frontal button “UP”, the thirteenth page appears indicating the alarm relay situation. The status of relay cannot be “ON” during the first 10 seconds after powering and cannot change during the parameters programming.

PARTICULAR DISPLAYING OF POWER FACTOR

- When the Apparent power is null, little lines are displayed
- When Cos phi =1 the mark is displayed
- When Cos phi =0 no marks are displayed
- The indication of 2nd quadrant (Power export) is displayed with Cos φ=120°

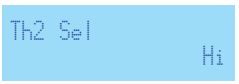


CONFIGURATION SELECTION MENU'

- To enter in programming phase press the right-hand button (UP) more than 4 seconds. "Program Mode" page will be displayed and after 4 seconds the other pages with actual values will be showed. If it is necessary to modify the parameters, press the button when it appears on the display. To increase the value press "UP", to decrease it press "DOWN". Maintaining pressure on the button the sliding is automatic and the speed increase automatically; once the needed value is displayed release the button (the new value will be saved in a permanent memory)

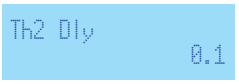
- **INPUT PASSWORD ADMITTING**
  This page will be displayed only if parameter "Password" was modified and it is different from "000". To enter in programming phase it is necessary to write the same memorized number otherwise you'll go out from this page

- **THRESHOLD 1/THRESHOLD 2 SELECTION**
  In this page it is possible to select the threshold type (Hi=max, Lo=min) and if it must remain light-out (OFF). In case OFF is selected, all the pages related to the threshold will be not present. It will be possible to act the relay by a MODBUS command from serial line.

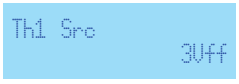


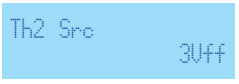
- **THRESHOLD 1/THRESHOLD 2 DELAY TYPE APPLICATION**
  In this page it is possible to select the delay threshold type which can be OFF-ON or ON-OFF.
  This page will be displayed if Th1/Th2 different from OFF

- **THRESHOLD 1/THRESHOLD 2 DELAY TIME**
  In this page it is possible to select the delay time threshold which can be selected from 0,0 to 25,5 seconds. This page will be displayed if Th1/Th2 different from OFF

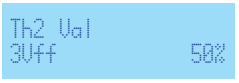


- **THRESHOLD 1/THRESHOLD 2 PARAMETER**
  In this page it is possible to select the parameter to which associate the threshold between: 3Vn,3A, F, W+, W-, DW, V12,V23,V31, V1,V2, V3, A1, A2 and A3.
  3 Phase-Phase voltages (Vff) is selected by default.
  This page will be displayed if Th1/Th2 different from OFF





- **THRESHOLD 1/THRESHOLD 2 PERCENTAGE VALUE**
  This page shows the selected parameter and its value . Default page = 50%. Starting with the selection, over the percentage value , you'll see the real equivalent value.
  This page will be displayed if Th1/Th2 different from OFF



- **CURRENT TRANSFORMER SELECTION (.../5A or .../1A)**
  In this page it is possible to select the primary value of CT in Ampere and it represent the end scale value of currents when 5A or 1A income. The possible range is from 5A to 6000A with 5A steps. The default value is 1000A.

- **VOLTAGE TRANSFORMER SELECTION (.../100V)**
  In this page it is possible to select the primary value of VT in Volts and it represent the end scale value of voltage when 100V income. Directly connected, this is the value of Phase-Neutral nominal voltage.
  The possible range is from 50V to 4615V (8000V for Phase-Phase voltage V-ff). The default value 231V

- **AVERAGE**
  In this page it is possible to select the reading numbers to which calculate the medium value. Practically it is the stability filter of measurements. Increasing the number, stability increases too. Regulation is possible from 1 to 15 and the default number is 3.

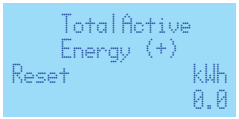
- **DEFAULT PAGE**
  First powering page. A different page can be selected within the available pages. The default page is 0.

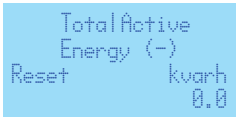
- **SERIAL PORT SPEED**
  In this page it is possible to select the interface type which changes by the model chosen.
  The meaning table is: 0= 9600 - 1=19200 – 2=38400 – 3=57600 – 4 =115200 bps. Default number is "0"

- **NODE ADDRESS (MODBUS PROTOCOL)**
  It is the instrument identification number for serial communications in the net. The address numbers are included from 1 to 255.
  Default value is 1.

- **PASSWORD**
  In this page it is possible to change the password in order to be able to enter in programming pages; it is constituted by 3 numbers between 000 and 999. Default value is "000"

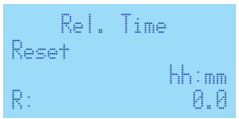
- **POSITIVE ACTIVE ENERGY RESET**
  It is enough to press one of the button to reset the value





- **NEGATIVE ACTIVE ENERGY RESET**
  It is enough to press one of the button to reset the value

- **REACTIVE ENERGY RESET**
  It is enough to press one of the button to reset the value



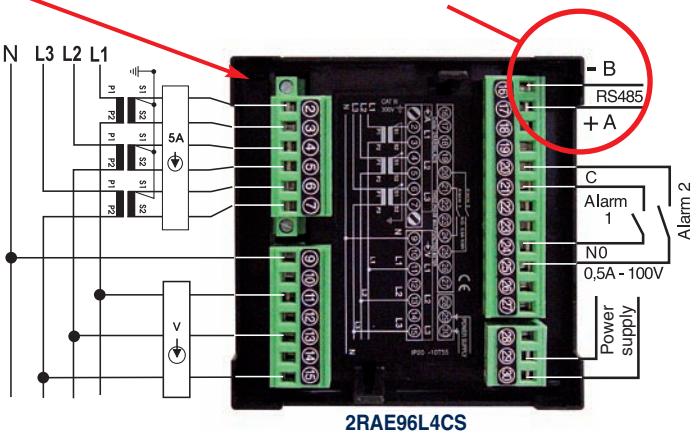
- **PARTIAL HOURS RESET**
  It is enough to press one of the button to reset the value

CONNECTION DIAGRAMS

NEW

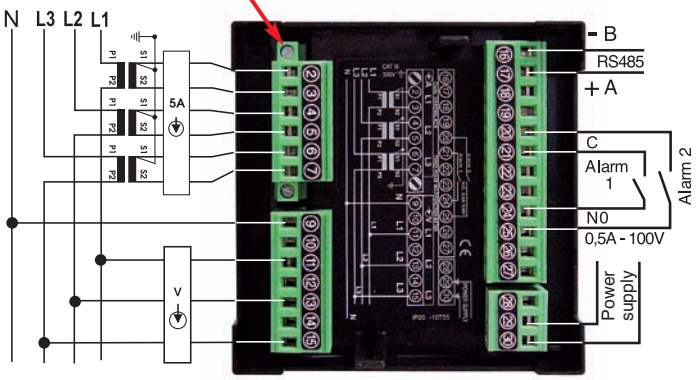
Differently from the others, the CT connecting terminal is fixed to avoid errors of insertion or damages caused by a possible secondary terminals CT opening

Option for **2RAE96L4CS485** version

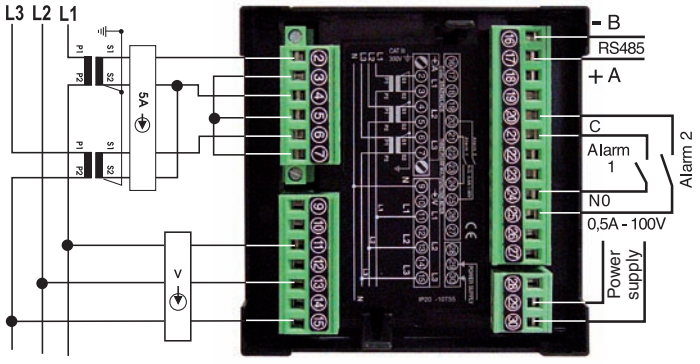


2RAE96L4CS
INSERTION WITH NEUTRAL

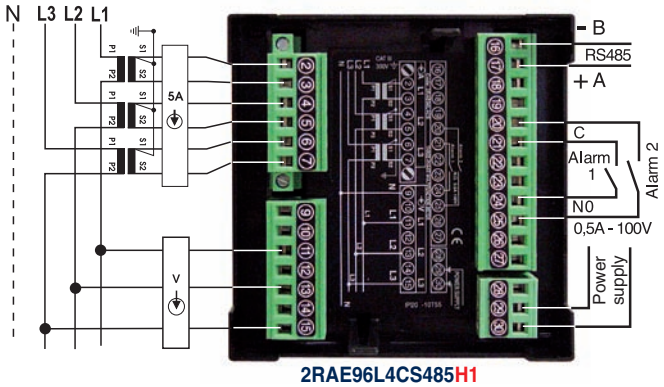
Differently from the others, the CT connecting terminal is fixed to avoid errors of insertion or damages caused by a possible secondary terminals CT opening



2RAE96L4CS485H1
INSERTION WITH NEUTRAL



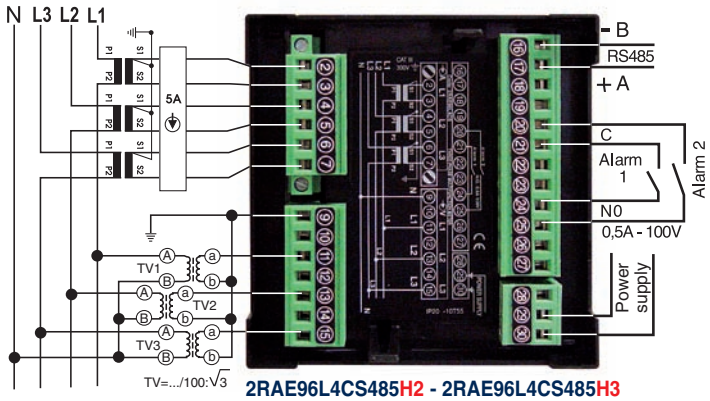
2RAE96L4CS485H1
ARON INSERTION



2RAE96L4CS485H1
INSERTION WITHOUT NEUTRAL

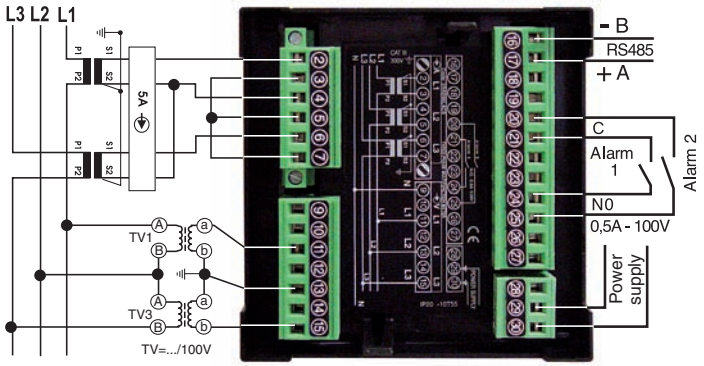
The same instrument can be connected in three different ways. For this reason (into the packing box) you'll find 3 different connection labels. So depending by the chosen connection the customer has to fix the proper label on the back side of instrument

VT CONNECTION DIAGRAMS

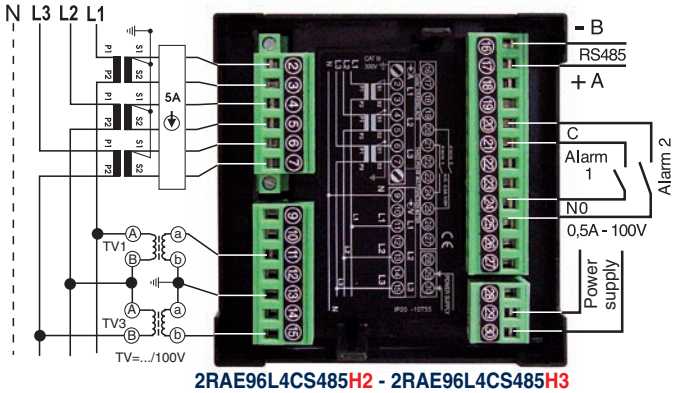


2RAE96L4CS485H2 - 2RAE96L4CS485H3
INSERTION WITH NEUTRAL

- Instruments with code ...CH2 show primary voltages up to 9,9kV
- Instruments with code ...CH3 show primary voltages from 10kV to 100kV



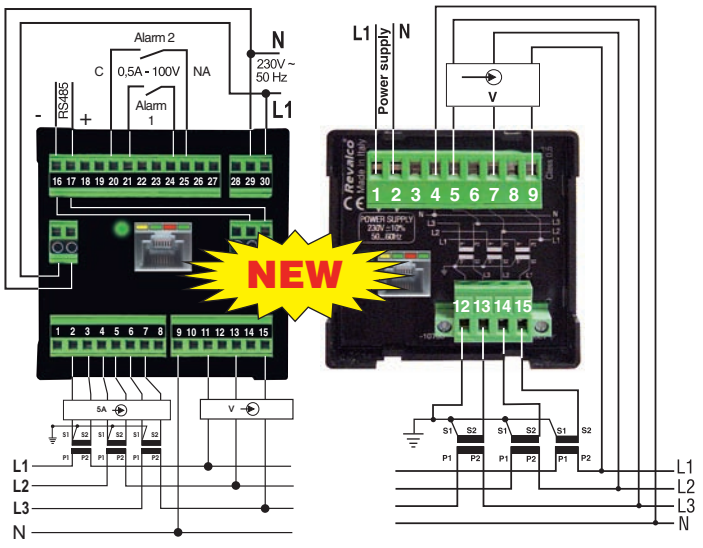
2RAE96L4CS485H2 - 2RAE96L4CS485H3
ARON INSERTION



2RAE96L4CS485H2 - 2RAE96L4CS485H3
INSERTION WITHOUT NEUTRAL

The same instrument can be connected in three different ways. For this reason (into the packing box) you'll find 3 different connection labels. So depending by the chosen connection the customer has to fix the proper label on the back side of instrument

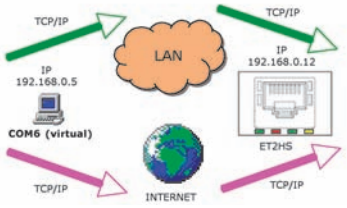
ETHERNET OPTION - TYPE ETH2S FROM SERIAL TRANSDUCER



FOR MODELS 2RAE96L4C485, 2RAE96L4CS485, 2RAE96L4CS485H2 AND 2RAE96L4CS485H3

FOR MODEL 2RAE72L4C

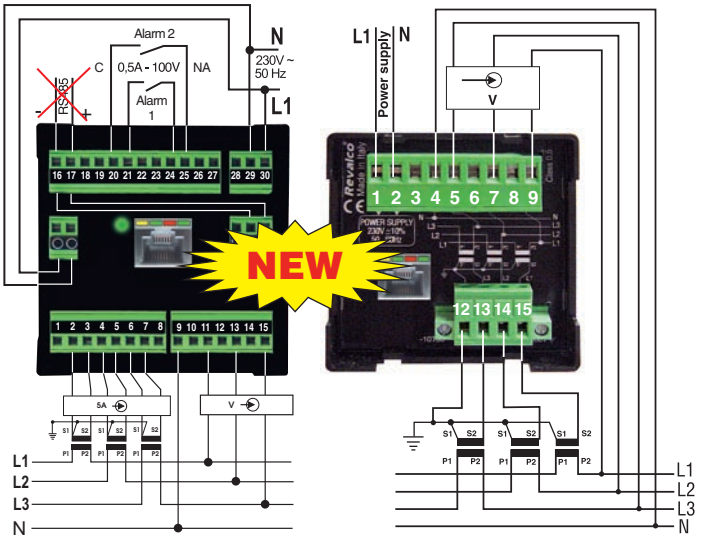
- PCB provided by an embedded RJ45 Ethernet socket and software
- Installing the software on a PC it is possible to have a series of tools which permit, passing through the Ethernet net (LAN or Internet), to establish together with the instrument a connection similar to a COM port (standard communications port) generated in virtual way, taking advantage as signal transport by the TCP/IP protocol.



- Hardware characteristics:
  - Transmission speed from 150 to 115.200 baud
  - Standard Ethernet socket RJ45
  - Ethernet port speed: 10/100 Mbit
  - Working situation controlled by 4 diagnostic leds
  - Ethernet port galvanically insulated
  - Not powered by the Ethernet cable or by the data net
  - Supports (without virtual COM port) UDP, ICMP(ping) and DHCP protocols
  - Working temperature: from -5°C to 55°C
- In particular way, after the connection of instrument to the net, the software permits to:
  - To assign an univocal IP address (example: 192.168.0.12)
  - Starting from IP address, to generate o PC a virtual port "COMx" (example: COM6) to which refer using the forms of this hardware. Every supervision software (SCADA or other) which dispose of Modbus RTU communication protocol will be able to converse with this device through this port avoiding the TCP/IP translation but under the condition that the device be reachable in the net (Intranet or Internet) by its IP (example by its address ping)

- ORDER EXAMPLES: 2RAE96L4C485230ETH2S; 2RAE96L4CS485-P1ETH2S; 2RAE96L4CS485H2-P2ETH2S

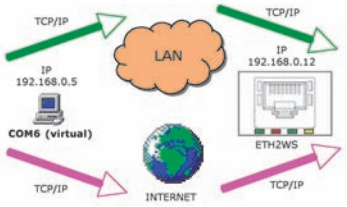
ETHERNET OPTION - TYPE ETH2WS FROM WEB SERVER



FOR MODELS 2RAE96L4C485, 2RAE96L4CS485, 2RAE96L4CS485H2 AND 2RAE96L4CS485H3

FOR MODEL 2RAE72L4C

- PCB provided by an embedded RJ45 Ethernet socket and software which permits under a request by a normal browser (example Internet Explorer) to enter in a Web server organized in web pages (HTML)
- Hardware characteristics:
  - Standard Ethernet socket RJ45
  - Ethernet port speed: 10/100 Mbit
  - Working situation controlled by 4 diagnostic leds
  - Ethernet port galvanically insulated
  - Not powered by the Ethernet cable or by the data net
  - Working temperature: from -5°C to 55°C

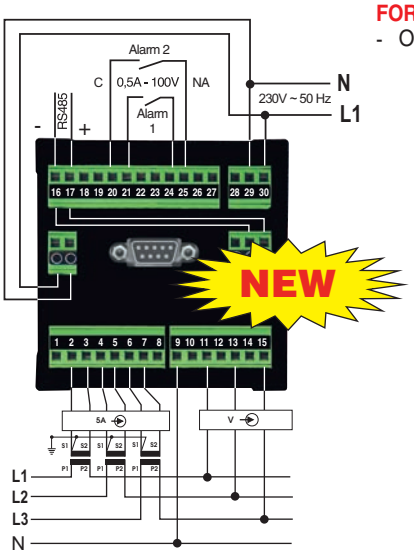


- In particular way, after the connection of instrument to the net, the software permits to:
  - To assign an univocal IP address (example: 192.168.0.12)
  - To assign an alphanumerical name to the product (example Substation SUD)
  - Enter to a Web server like a normal internet site simply dialling its IP address in a browser (example: Internet Explorer). In a simply graphic form (table) the main measures will be shown

  - Up to 8 contemporaneous sessions (8 different users contemporary connected)
  - Connect to this device through its IP but under the condition that the device be rea chable in the net (Intranet or Internet) (example by its address ping)

- ORDER EXAMPLES: 2RAE96L4C485230ETH2WS; 2RAE96L4CS485-P1ETH2WS; 2RAE96L4CS485H2-P2ETH2WS

PROFIBUS OPTION – TYPE PROF

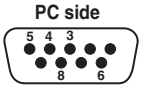


FOR MODELS 2RAE96L4C485, 2RAE96L4CS485, 2RAE96L4CS485H2 AND 2RAE96L4CS485H3

- ORDER EXAMPLES: 2RAE96L4C485230PROF; 2RAE96L4CS485-P1PROF; 2RAE96L4CS485H2-P2PROF

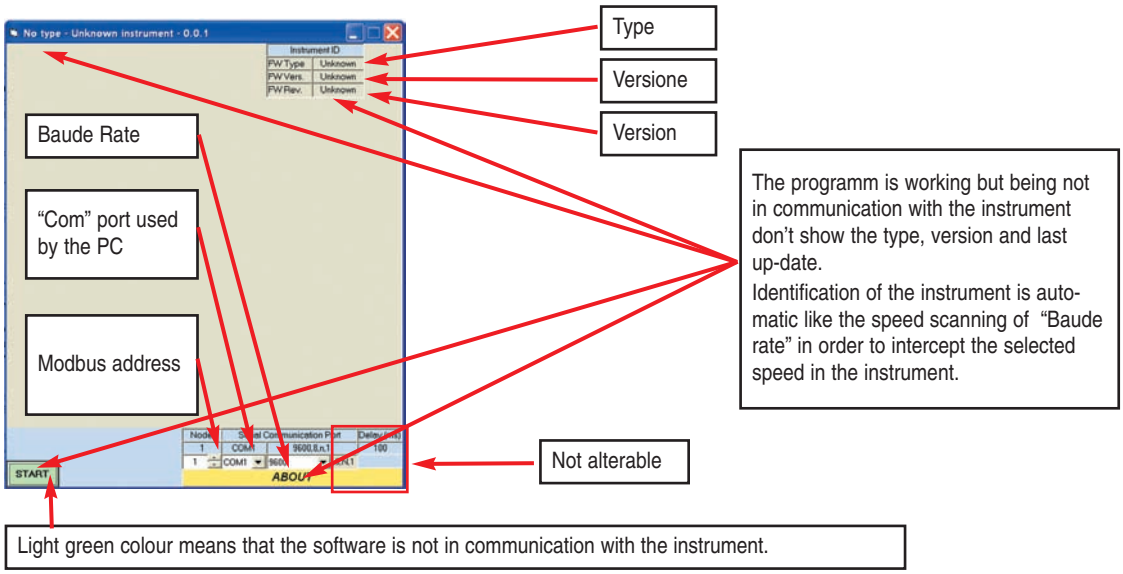
DB9F PROFIBUS CONNECTOR	
Pin	**Signal**
1	
2	
3	Line B
4	RTS
5	GND BUS (Insulated)
6	+5V BUS (Insulated output max 100mA)
7	
8	Line A
9	

PC side



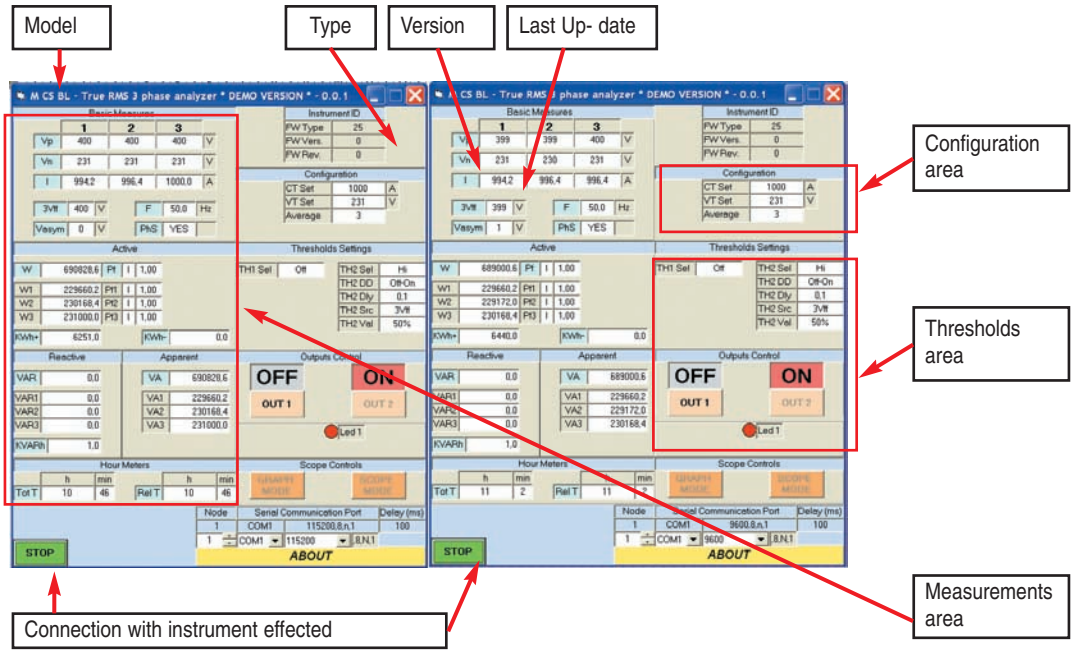
SOFTWARE USE

INSTRUCTIONS: Use of software equiped to the types provided by communication interface RS485, BL or RS485 and BL. After the download from CD or from the INTERNET WEB SITE the free software(it permits to see the main measurements available on the instrument) proceed to its installation. Once installed the software, execute the application. In “run” mode, the software will show this display:


Type
Versione
Version
Baude Rate
“Com” port used by the PC
Modbus address
The programm is working but being not in communication with the instrument don’t show the type, version and last up-date.
Identification of the instrument is auto-matic like the speed scanning of “Baude rate” in order to intercept the selected speed in the instrument.
Not alterable
Light green colour means that the software is not in communication with the instrument.

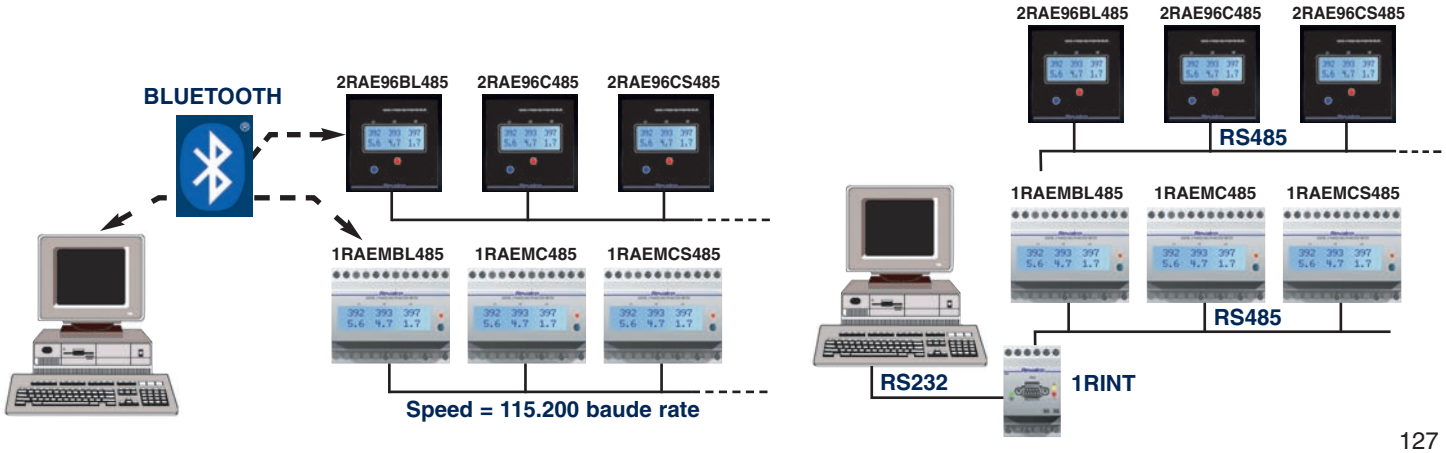
By the mouse press start.....

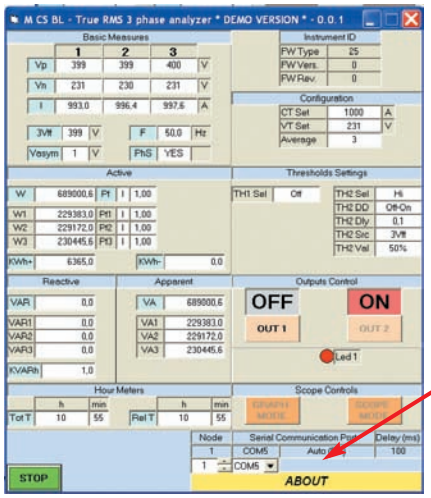
The instrument in this example is the BL type (the “Top” in our range). The software starts the scanning (self-identification) and it connect itself to the instrument.



Founded the connection by cableat 115200 bps or at 9600. Configured the display, it visualize the data.....OR

Possibility to use the “access point” in Bluetooth standard (peripheric inserted on USB port or on PC). In this way it is possible to have a wireless connection with this type of instrument with the advantage to access to the instrument by everybody know the PIN CODE (printed on the back of the instrument).
More, being present the RS485 interface it is possible the conversion from BLUETOOTH to RS485. It is possible to realize a WIRELESS connection with the first instrument in a chain of instruments having the RS485 interface only and by this access to the others. Alternatively it is possible connect in RS485 this instrument also and proceed to the pothers,if present, by a classic connection with two standard wires.

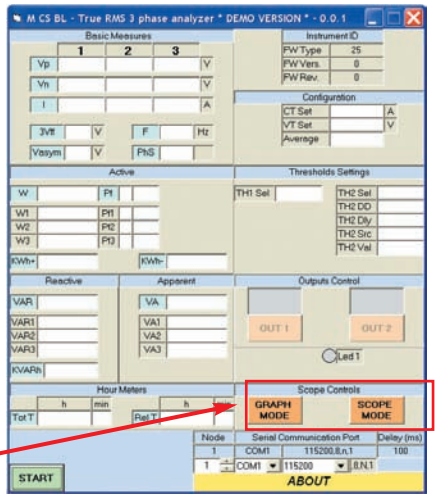




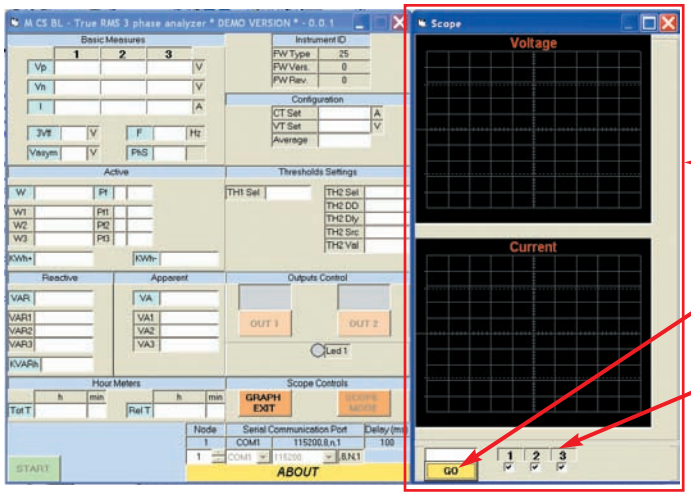
Connection to bluetooth port (example COM5); parametres become “AUTO”

By pressing STOP button the word changes to START; the colour change (light green = stop). From the display the data disappear being the connection with the instrument suspended. In this condition it is possible to push one of the two graphic buttons. Press GRAPH MODE.

Bluetooth connection



“Oscilloscope” visualization mode



The software visualizes contemporary the measurements in numerical form and their wave form like the oscilloscope. It is capable to manage the synchronism of phase L1 and to visualize by six different traces, the relative three voltages and currents.

“Oscilloscope” visualization mode

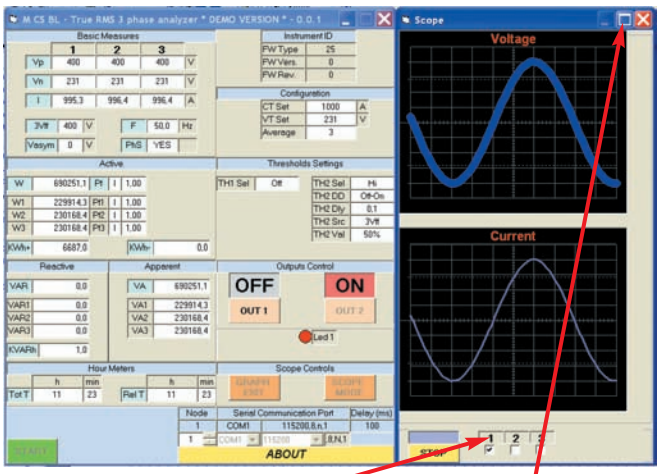
“Start of communication “ button”

Insertion of phases to visualize(voltage and current)

Indipendently by the previous “Com” speed, it is forced and blocked on 115200 bps. The connection with the instrument continues in “MODBUS RTU” as before.

By pressing the “GO button, the connection with instrument starts.

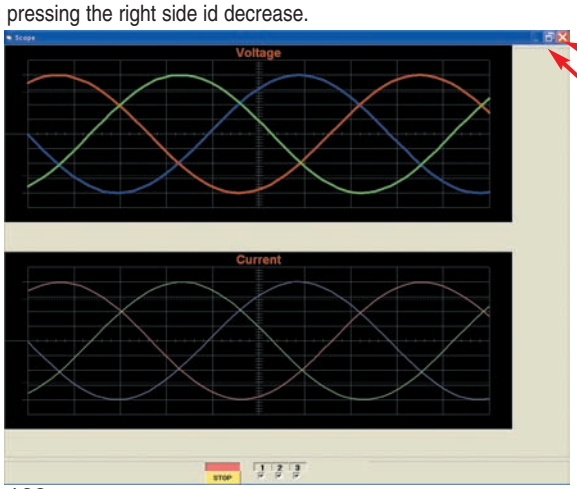
Measurements and curves are simultaneous. Colours are equal for the voltage phase and relative current. The n. 1 (relative to phase L1) is blue-light blue, the n. 2 (relative to phase L2) is red-light red, the n. 3(relative to phase L3) is green-light green By pressing the left side of the mouse on a graphic, the thickness of the line increase, by pressing the right side id decrease.



Line 1 only is selected

“Enlarge” the window.

By pressing the left side of the mouse on the graphic, thickness of line increase; by pressing the right side of the mouse it decrease.

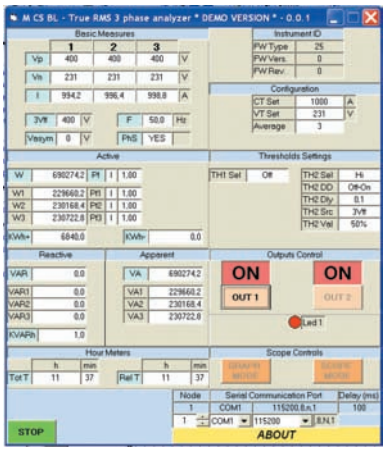


Close

Reduce

It is possible tu visualize the curves on the big display using the “enlarge” button. By “Reduce” the display come back small, while the button “Close” the application is NOT CLOSED but it shows the original display with measurements and graphic (the graphic is setted up again as “Default”).

To stop, press “STOP”; to exit press “GRAPH EXIT” in meantime actived.



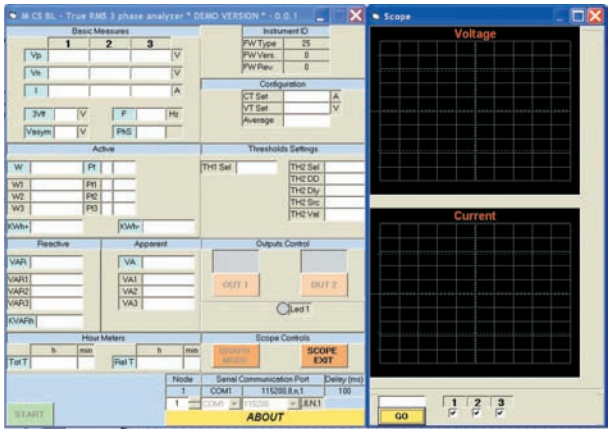
Coming back in measurement mode, when the button START/STOP is green, it is possible to use the output relay 1 (this is permitted when the output is not used as alarm).

It means that during the programm phase threshold 1 remains in “off” so it is possible to control it from remote as an available resource for generic use (swith-on or switch-off lamps or machines etc.)

Push STOP to restore the graphic access keys .

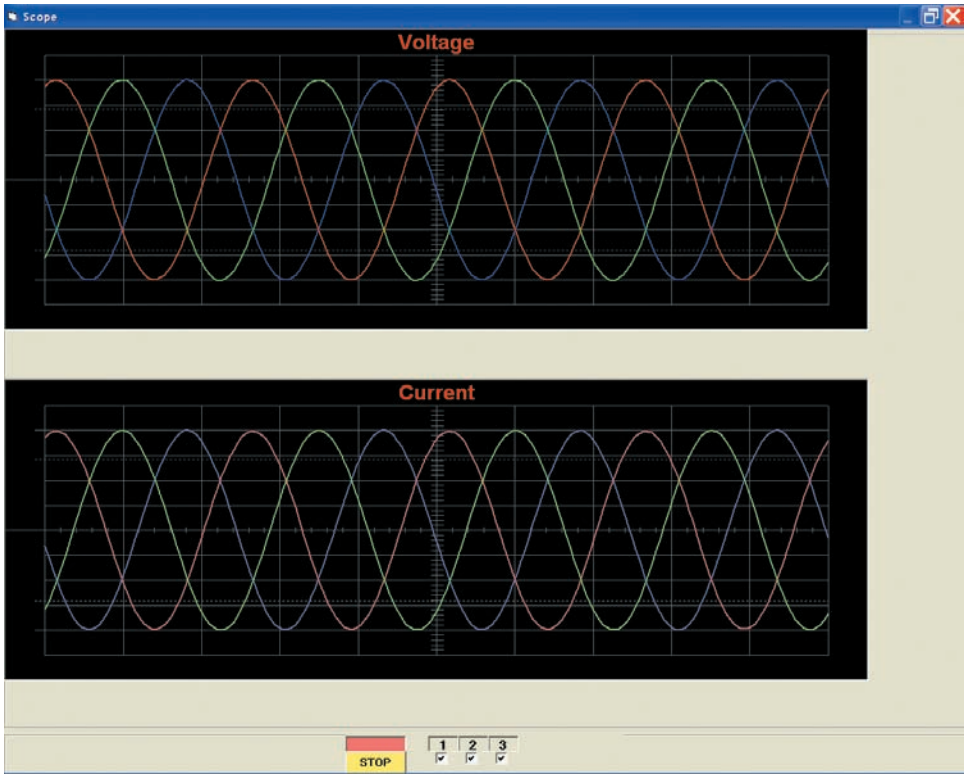
OSCILLOSCOPE FUNCTION

Press “SCOPE MODE”



After “SCOPE MODE” is pressed the graphic display works as before but:
1) The numerical measurements are not displayed
2) The connection with the instrument is not MODBUS RTU but propietary
3) The display shows frequently a lot of graphic informations

The scope of this software resource, is to obtain the visualization of temporary phenomena in real time having an “oscilloscope with six quick traces” .



This software version is FREEWARE.

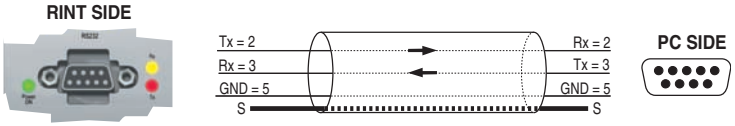
- In a next future, on the web site, you’ll find a PRO (professional) software to obtain a more complete electrical analysys of the data furnished by the instrument. It will be enriched by measurements as result of mathematical and geometrical the wave form analysys of the electrical signal.
  The PRO version will be under use’s licence and not Freeware

COMPUTER INTERFACE

1RINT

Is an interface for use with personal computers compatible with IBM AT via a serial cable RS232 CANNON DB9 with the following characteristics:

- PC Entry, female connectors, nine pin
- Interface Entry, male connectors, nine pin
- In cases of Line Disturbance, connect the “S” wire (contained in the cable) to ground, on one side.

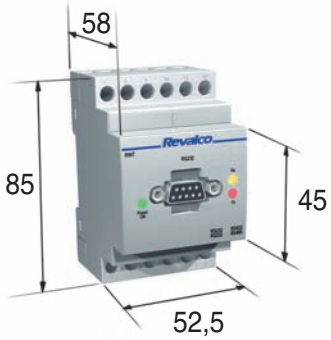


This converter can work with either 422 or 485 which are selectable by means of a switch located in the upper part of the device (under the slide).
The device works also as galvanic separation between serial lines.

When the interface is powered, the working green led lights (Power ON), while during the comunication, the yellow led lights (Rx) for the input signal and the red led lights (Tx) for the output signal.
The speed of the serial comunication is selfconfigured, between 1200 baud and 19200 baud. It adapts to the speed of the instrument to which the converter is connected.

TEST VOLTAGE	2 kV a 50Hz for 1 minute
POWER SUPPLY	230V +/- 10% 50/60Hz
WORKING TEMPERATURE	-5°C...+ 50°C
STORAGE TEMPERATURE	- 20°C...+ 80°C
PROTECTION DEGREE	IP 20
CONSUMPTION	3VA
BIDIRETIONAL SERIAL COMMUNICATION	selectable between RS 232 / RS 422 and RS 232 / 485
DIMENSIONS	3 rail DIN modules

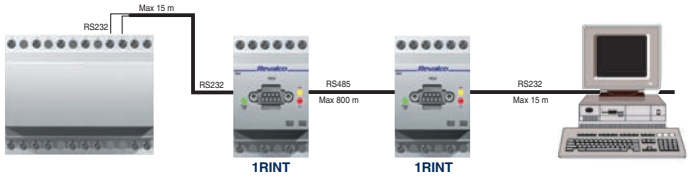
DIMENSIONS in mm



CONNECTION

SERIAL COMMUNICATION

Example of application: connection for distances more than 15 meters



RINTC

The USB Serial Converter permits the installation of a virtual serial port (COM) by the use of a PC USB port.
New installed port will be “sen” by the operative Windows system as an additional COM port and it can be used in every application. This device is supplied in a standard kit which includes:
- 485 cable which permits the use as converter from RS232 to RS485 interface
- 2323 adapter cable able to create the virtual serial port starting from an USB port.

Kit is comprehensive of software driver for Windows XP and Windows Vista.

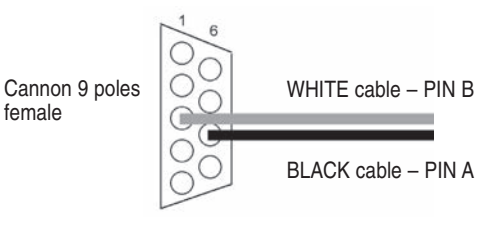
Software available on our web site www.revalco.it

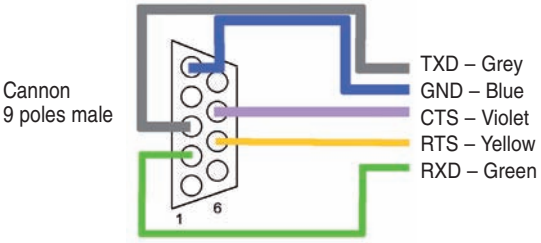
PC side
USB 2.0 interface full speed compatible
UART (Integrated serial interface) 7 or 8 bit with parity Odd/Even/Mark space/No parity
Hardware compatibility (RTS#/CTS#) or X-On/X-OFF software handshaking
Power supply from USB interface (max 50mA) only

ADAPTER Side
- Status indication “ FRAME TRANSMISSION ON AIR!”
- Two, not contemporaneous possibilities of use are possible:
  1) RS485 Serial Interface galvanically insulated (3kV) for conventional net, two wires
  2) RS232 Serial Interface for conventional net, 5 wires

RS485 Communication data
- Communication with hardware interface, 2 wires (A and B)
- Up to 32 devices contemporary
- Ring with 800 meters max extension
- 3kV galvanic insulation
- Baud rate from 1200 to 115200 bps

RS232 Communication data
- Communication with hardware interface, 5 wires (RX-TX-CTS-RTS-GND)
- Point-point Connection
- Ring with15 meters max extension
- No galvanic insulation
- Baud rate from 1200 to 115200 bps





Ambient conditions
Ambient temperature: nominal range 0….+45°C – extreme range: -5…+55°C – storage temp.: -10….+70°C
Relative humidity: 10….95% - Atmospheric pressure: 70…110 kPa

Standards
Safety:
Electromagnetic Compatibility (immunity): CEI EN 61000-6-2 (ex EN 50082-2) - Electromagnetic Compatibility (emission):: CEI EN 61000-6-4 (ex EN 50081-2)

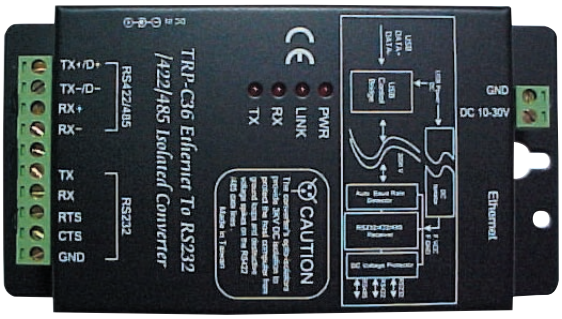
2TRP

Ethernet connection

By the use of a TRP transducer, it is possible to connect the electrical measurement station in a more wide net of ethernet resources.

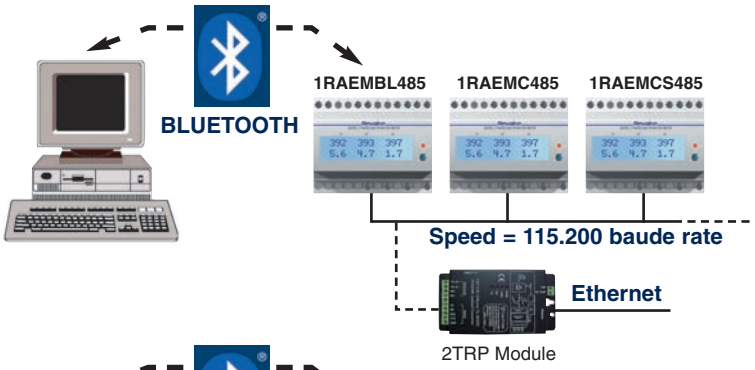
From one side TRP will communicate in MODBUS RTU RS485 with the station or with the ring of stations present in the net

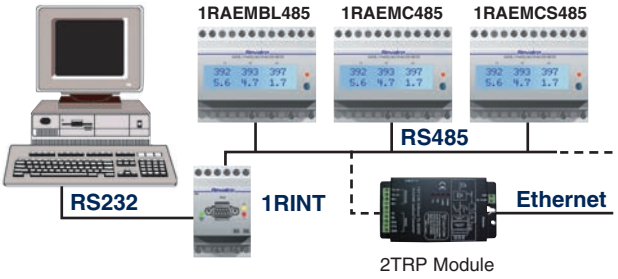
From the other it will be inserted by a RJ45 connector in an ethernet ring.IP address is settable on the TRP transducer.

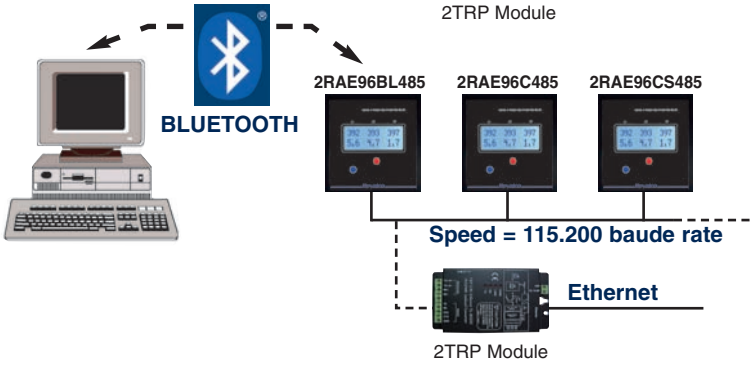


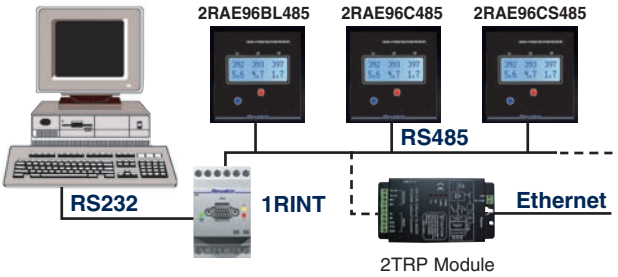
The transducer is galvanically insulated up to 3kV DC between two interfaces and it is protected by the surge of interface RS422/485. It is therefore recommanded in case of long wires connection and/or in case on whichit is possible to have differences of potential between the devices.

This TRP transducer has the I/F ethernet on the connector RJ45 and terminals for connection of I/F RS232/422/485 and power supply. It incorporate an "http" server; it permits to enter on all function's (communication parameters set also), directly through the ethernet way from a normal browser (example: Internet Explorer).

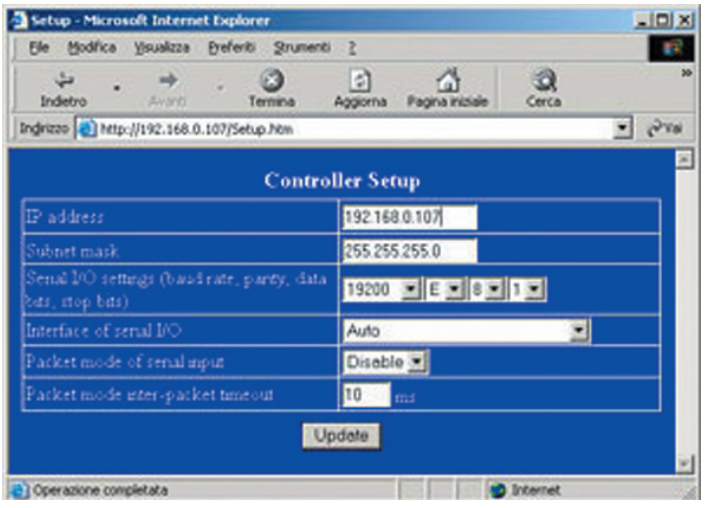








SCREEN SETUP



TECHNICAL CHARACTERISTICS

Auxiliary power supply	10-30Vdc 1.2W
Interface data	Ethernet RJ45 10Mbps RS232 RS422/485
Baud rate	from 1200bps to 115Kbps
Protocols	ARP,UDP, TCP, ICMP, HTTP, DHCP, IP
Status indicators	Power ON Link RX/TX Activity
Galvanic insulation	3000Vdc
Working temperature	from -20 to +75°C Humidity: 10-95%
Dimensions	75x150x25mm
Weight	240g
Standards	EN 55022 EN 55024 EN 61000-3-2 EN 61000-3-3